GAS

JULY 1961

Federal Power Commission

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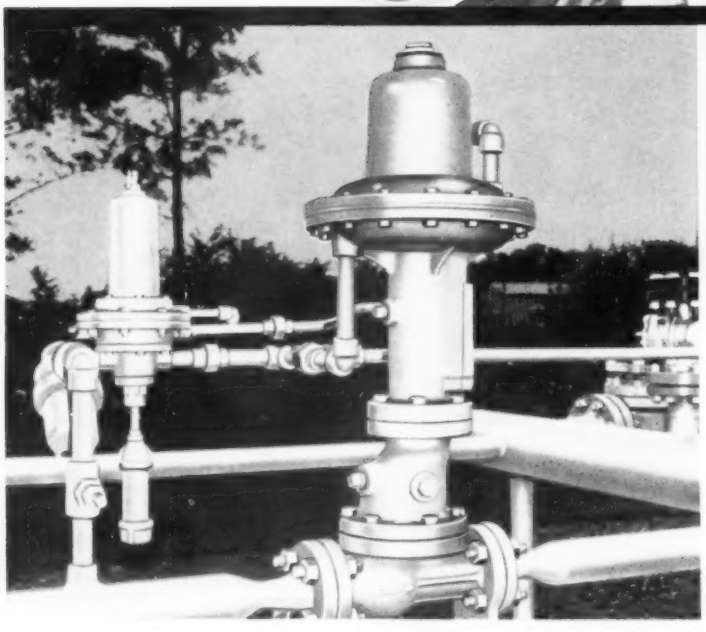

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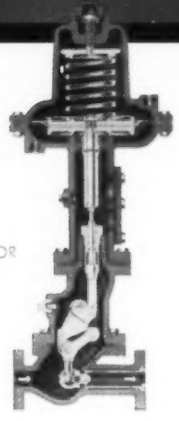

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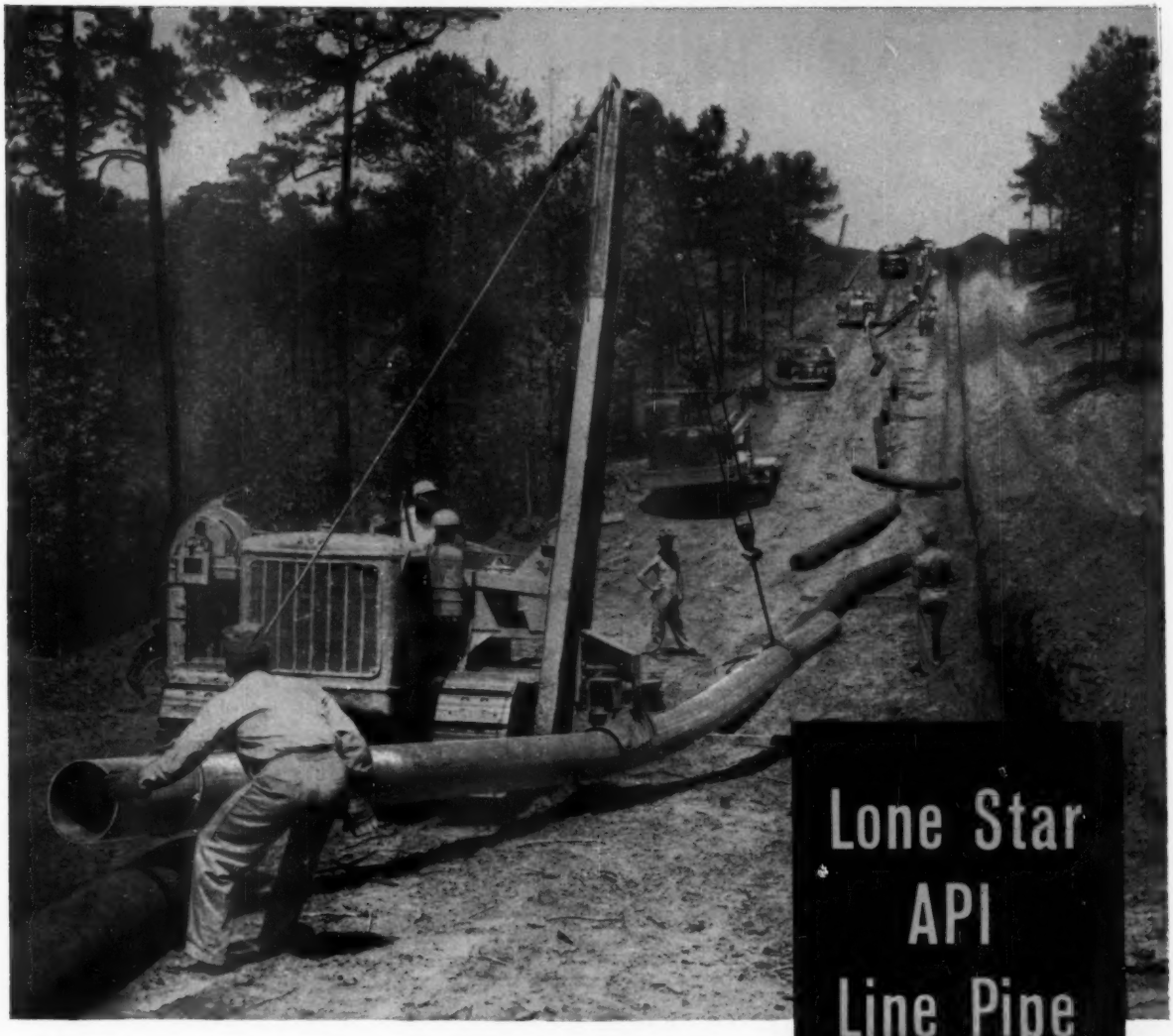

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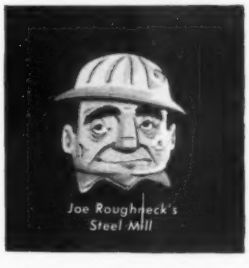

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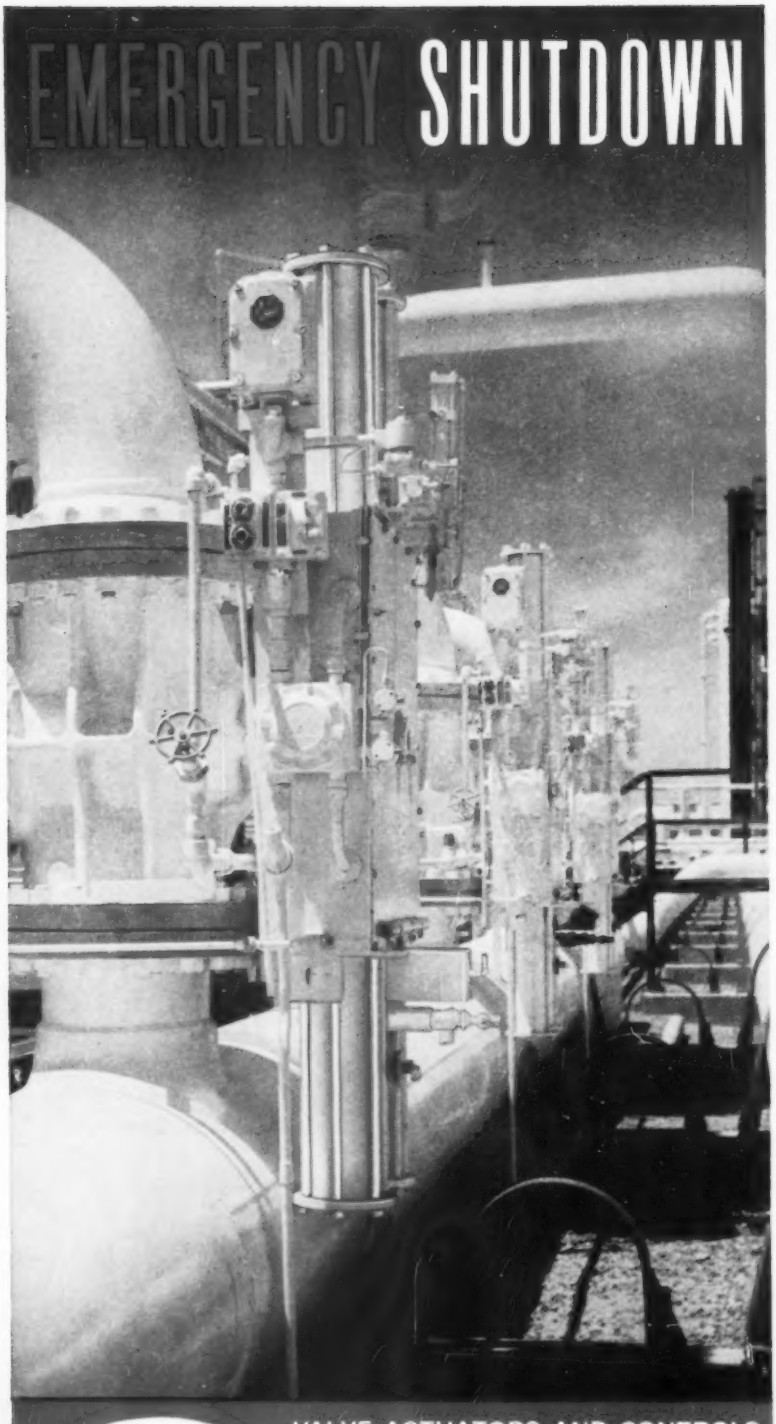

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CALENDAR

August

17..AGA Regional Transmission Roundtable Conference — Cleveland-Pick Carter Hotel, Cleveland, Ohio.

September

7..Rocky Mountain Gas Association Annual Banquet—Denver Hilton Hotel, Denver, Colo.

11-13..AGA Annual Accident Prevention Conference—Statler Hilton Hotel, Dallas.

12-14..Mid-West Gas Association School and Conference—Ames, Iowa.

13-15..Pacific Coast Gas Association Annual Convention—Coronado Hotel, Coronado, Calif.

15-16..Maryland-District of Columbia Utilities Association Fall Conference — Cavalier Hotel, Virginia Beach, Va.

18-19..Independent Natural Gas Association of America Annual Meeting—Shamrock Hilton Hotel, Houston.

18-22..AGA Industrial Gas School — Mariott Motor Hotel, Philadelphia, Pa.

20-22..Southeastern Gas Association Annual Meeting—Roanoke, Va.

October

1-4..American Gas Association Annual Convention—Dallas

3-4..Ninth Annual Gas Measurement Institute (University of Kansas) —National Guard Armory, Liberal, Kans.

12-13..California Natural Gasoline Association 36th Annual Fall Meeting — Lafayette Hotel, Long Beach, Calif.

16-20..National Safety Council—Chicago, Ill.

18-19..Wisconsin Utilities Association Gas & Electric Sales & Operating Convention—Schroeder Hotel, Milwaukee, Wis.

19-20..AGA Marketing Research Seminar—Essex Inc, Chicago, Ill.

24-25..AGA-NEGA Safety Course — Parker House, Boston, Mass.

29-31..Independent Petroleum Association of America Annual Meeting —Shamrock Hilton Hotel, Houston, Texas.

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Thermally Thinking

JULY 1961

If men were angels

I AM not angry this month. I am fuming mad.

We hear The Honorable Albert Gore (D., Tenn.) say on the Senate floor there is no real inducement for natural gas companies to settle rate cases, or seek positive FPC action. We hear Everett McKeage, president of California's Public Utilities Commission, say in Washington that natural gas companies profit by delay. California's Gov. Pat Brown echoes this theory and adds that natural gas rates can be increased in a cavalier manner. (To me, such philosophy tends to substantiate those who say California is better at developing busts than brainpower—actually, I'm from Texas, dear hearts.)

And we hear from Washington that gas companies file pancake rate applications merely to add to FPC's work load and prolong delay in case disposition; pipeline companies use money collected subject to refund under suspended rate increases as a source of capital to finance system construction; consumers do not receive refunds when all or part of a suspended rate increase is not allowed; gas companies are determined to fleece their customers and do not try to hold rates as low as is consistent with the type of gas service the public has learned to expect; and so forth.

The base stupidity of such mouthings is readily apparent to anyone with any gas industry experience at all. The point is that allegedly responsible, intelligent men of government (both federal and state) have been saying or implying these untruths in Washington. They do so in an effort to lead the public away from government's own inability to regulate a natural gas industry that actually cries for proper, fair regulation. They remind one of a feist that turns with fury on a companion of a moment ago which is down with a wound from battle.

I challenge them with these words:

"If men were angels, no government would be necessary. If angels were to govern men, neither external nor internal controls on government would be necessary. In framing a government which is to be administered by men over men, the great difficulty lies in this: you must first enable the government to control the governed; and in the next place oblige it to control itself."—Alexander Hamilton (1765).

I will remind men of government that the federal government, through Congress, wrote the Natural Gas Act; the government similarly created FPC and oversees its operations; and only the government, as agents of the public, can change part or all of the Act and the commission. Certainly gas companies cannot. Nor did gas companies pass the current laws, set up and staff the commission, nor lay out the procedures of natural gas regulation. The most gas companies can do is fight the good fight and then go to court. And I will further remind that gas companies do not control courts and appoint judges.

President Kennedy, his close advisors (termed the "Irish Mafia" in a recent issue of SEP), the House Oversight Committee, Dean Landis, the NARUC, and the FPC itself have said natural gas regulation is less than completely successful. Thus, we have a clearly evident failure of government, not the gas industry.

You men of government will not solve even one thing by twisting facts to misinform the public that the gas industry is the prime reason for government's failure to produce equitable or even workable natural gas regulation. Nor are punitive bills the answer. Rather, earn your support and votes through constructive moves that will nourish this great old democracy.

If the problem of natural gas regulation is too large for you men of government, get out of Washington—go home—go back to selling shoes, clipping coupons, or whatever.

Thirty-two million-plus gas consumers demand that gas regulation problems be solved. They must be solved and I think will be solved. But they will not be solved if every boondoggling government official places the making of political hay over the needs of the gas consuming public and the industry that serves it.

I will further say to state and federal officials that no agency or group of people—including gas consumers—wants quick, efficient, realistic and completely equitable regulation of natural gas even half as much as the gas industry itself.

J. Ford Ehlen

EDITOR

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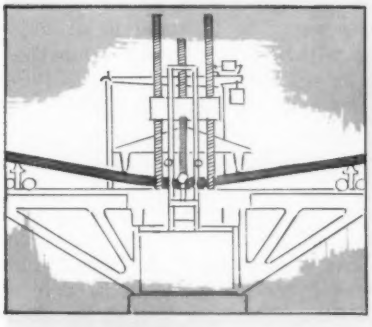

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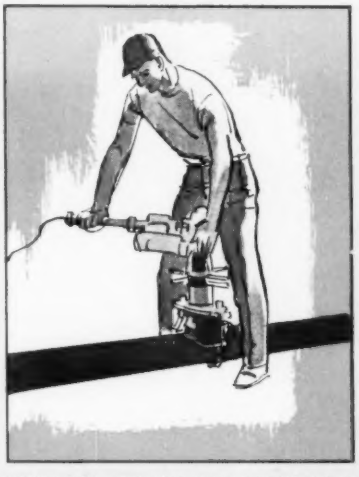

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GAS HIGHLIGHTS

Harris hurls another bill into hamper

Congress has a new natural gas bill from Rep. Oren Harris (D., Ark.), chairman of the House Commerce Committee. H. R. 7575 substitutes commodity pricing of producers' gas for utility-cost—though FPC could use cost in determining market value, but not require it in all cases. The bill would exempt small gas producers (under 2 billion cu ft per year); it would give FPC control of off-peak industrial sales; pancake rate increases are prohibited, but not for gas producers. GAS' Regeimbal says: "It is a compromise bill designed to give almost every side of the controversy something; and for this reason, is likely to draw fire from the gas industry and from others as well."

New A/C rate at PGW

Philadelphia Gas Works will reduce rates for its residential, commercial and industrial customers using gas air conditioning during summer months. GAS' Bill Harper reports residential customers will get a one-third discount, and commercials and industrials will get a 50 per cent cut in rates for gas air conditioning—effective July 6.

Enchilada Inch confab inches along

California's PUC has spent 17 days—spread over six months—hearing the Enchilada Inch matter. Opponents have yet to present their direct. Looks like cross-examination of proponents' witness will take five to eight more hearing days—extending the sessions into September. Los Angeles air has been heavy with applications for dismissal, mistrial, and counter filings. (See Bob Clay's roundup, p. 118.)

PUC says SoCal Gascos met Rock Springs conditions

California's PUC found that SoCounties and SoCal Gas companies (both Los Angeles) have fulfilled conditions PUC set on their certificate to purchase additional gas from El Paso Natural and to construct a new pipeline to the California-Nevada border to take Rock Springs gas. Price of gas was rolled back from 40 cents/Mcf to 33.4 during '62 and '63 when the additional gas will be handled through essentially existing system of both companies.

Liquid methane for England closer

England's Gas Council is about ready for submission to the Minister of Power its plan to import liquid methane from Algerian natural gas fields. The program would require three years for development. Then, at least 10 per cent of that country's gas supply would be tankered in a liquid state. Gas Council has been negotiating with the two French companies involved. Gas will come from the Hassi R'Mel field. It will move to Port Arzew (near Oran) via a 24-in., already built pipeline. A liquefaction plant will be required on the Mediterranean. Tanker design has been completed for two special 10,000-11,000 gal. liquid methane carriers.

Natural gas may help explore outer space

NASA is studying liquid hydrogen as a fuel for space vehicles. Linde Div. of UCC has a contract to supply that fuel for the project. Southern California Gas is supplying natural gas as feedstock for the liquid hydrogen plant. Natural gas is converted by cracking its methane in a catalytic furnace to form hydrogen and CO_2. Hydrogen is then liquefied at —453 deg. F via a series of compression and expansion stages.

Situation normal —Fish plans new gas pipeline

Ray C. Fish, chairman of the Fish Engineering Corp. (Houston), has preliminary plans for a new natural gas pipeline from northwest Oklahoma to St. Louis and the adjacent industrial area of western Illinois. Oklahoma Illinois Gas Pipeline Co. has been formed to build the large-diameter, 550-mile system.

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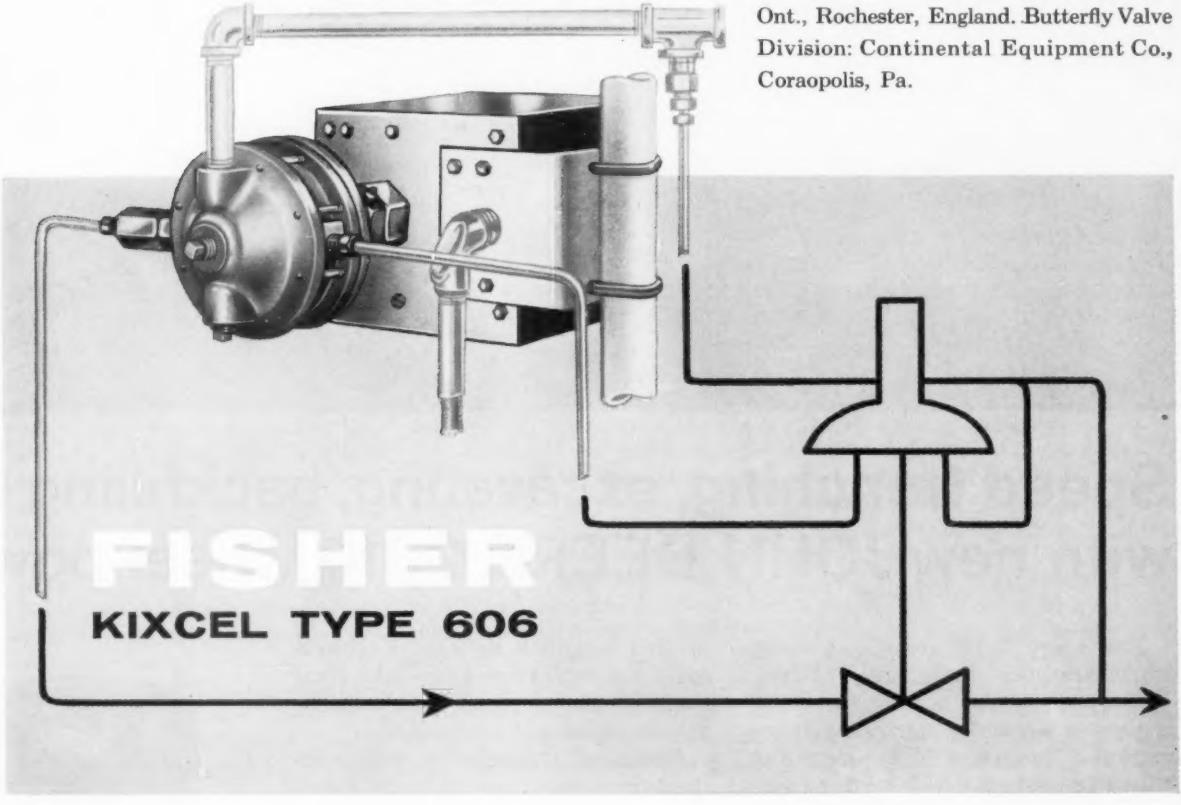

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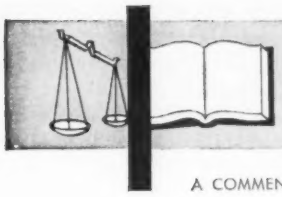

Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

Culpable conduct

UNETHICAL conduct in the Government has received the spotlight in recent years. The culpable conduct of a few who defy moral standards smears the reputation of the many. In a modern representative democracy the people must have confidence in the integrity of government officials or decay sets in. Now for those relatively few blameworthy persons, rules of ethical conduct will be enforced, and faith in representative government should be renewed.

In a recent message to Congress, the President diagnosed the disease and prescribed a remedy. Here is what he said:

"No responsibility of Government is more fundamental than the responsibility of maintaining the highest standards of ethical behavior by those who conduct the public business. There can be no dissent from the principle that all officials must act with unwavering integrity, absolute impartiality, and complete devotion to the public interest. This principle must be followed not only in reality but in appearance. For the basis of effective Government is public confidence, and that confidence is endangered when ethical standards falter or appear to falter.

"I have firm confidence in the integrity and dedication of those who work for our Government. Venal conduct by public officials in this country has been comparatively rare—and the few instances of official impropriety that have been uncovered have usually not suggested any widespread departure from high standards of ethics and moral conduct.

"Nevertheless, in the past two decades, incidents have occurred to remind us that the laws and regulations governing ethics in Government are not adequate to the changed role of the Federal Government, or to the changing conditions of our society. In addition, many of the ethical problems confronting our public servants have become so complex as to defy easy commonsense solutions on the part of men of good will seeking to observe the highest standards of conduct, and solutions have been hindered by lack of general regulatory guidelines. As a result, many thoughtful observers have expressed concern about the moral tone of Government, and about the need to restate basic principles in their application to contemporary facts.

"Of course, public officials are not a group apart. They inevitably reflect the moral tone of the society in which they live. And if that moral tone is injured — by fixed athletic contests or television quiz shows — by widespread business conspiracies to fix prices—by the collusion of businessmen and unions with organized crime — by cheating on expense accounts, by the ignoring of traffic laws, or by petty tax evasion—then the conduct of our Government must be affected. Inevitably, the moral standards of a society influence the conduct of all who live within it—the governed and those who govern.

"The ultimate answer to ethical problems in Government is honest people in a good ethical environment. No web of statute or regulation, however intricately conceived, can hope to deal with the myriad possible challenges to a man's integrity or his devotion to the public interest. Nevertheless formal regulation is required—regulation which can lay down clear guidelines of policy, punish venality and doubledealing, and set a general ethical tone for the conduct of public business."

• Statutory reform

There are seven statutes termed "conflict-of-interest" statutes. The seven statutes cover four basic problems:

The Government employee who acts on behalf of the Government in a business transaction with an entity in which he has a personal economic stake.

The Government employee who acts for an outside interest in certain dealings with the Government.

The Government employee who receives compensation from a private source for his Government work.

The former Government employee who acts in a representative capacity in certain transactions with the Government during a 2-year period after the termination of his Government service.

Five of these statutes were enacted before 1873. Each was enacted without coordination with any of the others. All but one impose criminal penalties. There is both overlap and inconsistency. Every study of these laws has concluded that they are grossly deficient in form and substance.

The fundamental defect of these statutes is that: On the one hand, they permit an astonishing range of private interests by public officials which are incompatible with the duties of public office; on the other hand, they create unnecessary obstacles to recruiting qualified people for Government service.

The principle which they embody in varying form—that a public servant owes undivided loyalty to the Government—is as important today as when the first of these statutes was enacted. However, the

statutory execution of this principle in the seven statutes was often directed to specific evils which at the time of their enactment were important political issues. As a result large areas of potential conflict of interest were left uncovered. For example, where some of these conflict-of-interest statutes are restricted to "claims of money and property" they do not protect the Government against the use of official position, influence, or inside information to aid private individuals or organizations in Government proceedings which involve no claims for money or property. Yet the danger of abuses of Government position exist to an equal if not greater degree in proceedings such as license applications for TV or radio stations, airline routes, electric power sites, interstate gas pipelines, and similar requests for Government approval.

Thus, literally read, it would be a crime punishable by fine or imprisonment under these statutes for a postal clerk to assist his mother in filing a claim for a tax refund, but it would be permissible for a Cabinet officer to influence an independent agency to award a license for a TV station to a business associate in a venture where he shared the profits.

Similar defects exist in the case of Government officials who left Government service. Clearly such an official should be prohibited from "switching sides" in a matter which was before him in his official capacity. But for technical reasons the statutes aimed at this situation do not always hit the mark.

The statutes leave important areas unregulated, but they also serve as a bar to obtaining important personal services for the Government through excessive regulation when no ethical problems exists. Fundamentally, this is because the statutes do not take into account the role in Government of the part-time adviser whose counsel has become essential but who cannot afford to be deprived of private benefits in the way now required by these laws. Wherever the Government seeks the assistance of a highly skilled technician, be he scientist, accountant, lawyer, or economist, such problems arise.

In general, even occasional consultants can technically be regarded as "officers or employees" of the Government, whether or not compensated. Then they are within the prohibitions applicable to regular full-time personnel.

To meet this need for statutory reform, the President sent Congress a proposed Executive Employees' Standards Act — a comprehensive revision of existing conflict-of-interest statutes. He thinks that "this bill maintains the highest possible standards of conduct, eliminates the technical deficiencies and anachronisms of existing laws and make it possible for the Government to mobilize a wide range of talent and skill."

The bill closes gaps in regulation and eliminates many of the pointless differences in treatment. For example, no longer will some former Government employees be subject to more severe restrictions because they worked for 1 of the 10 executive "departments" rather than in an agency which is not technically a department.

The bill overrules judicial interpretation that only when a claim for money or property is involved is a former Government employee prohibited from working for a private interest in the same matter for which he once had governmental responsibility. The issue of integrity is related to Government regulation as well as to property or money claims.

The bill establishes standards for skilled individuals whose primary activity is in private life, but whose skills are used by the Government on a part-time or advisory basis. By permitting individuals to carry on private business, as long as there is no direct conflict between their private and public work, ethical principles are maintained and a range of abilities are made available to Government.

This bill adds to the traditional criminal sanctions by permitting agency heads to adopt regulations and impose disciplinary measures. Most of the existing laws are criminal statutes. They have been strictly construed and, because of their harshness, infrequently invoked. By granting this added flexibility, it should ensure more effective enforcement. In addition, the regulations which are adopted will be more specific adaptation of the general prohibitions to the activities of particular agencies.

The bill deals with employees involved in executive, administrative, and regulatory functions. It does not apply to the judicial or legislative branch of Government. Existing laws relating to the judiciary are adequate. The adequacy and effectiveness of laws regulating the conduct of Members of Congress and congressional employees is left to congressional determination.

• Private contacts with officials of regulatory agencies

President Kennedy made this searing statement about unethical conduct involving officials of the independent agencies who regulate many of the economic forces in our society including the transportation, communications, electric and gas industries:

"Some of the most spectacular examples of official misconduct have involved ex parte communication—undisclosed, informal contact between an agency official and a party interested in a matter before that official. Such covert influence on agency action often does basic injury to the fairness of agency proceedings, particularly when those proceedings are judicial in nature.

"This problem is one of the most complex in the entire field of Government regulation. It involves the elimination of ex parte contacts when those contacts are unjust to other parties, while preserving the capacity of an agency to avail itself of information necessary to decision. Much of the difficulty stems from the broad range of agency activities — ranging from judicial-type adjudication to wide-ranging regulation of entire industries. This is a problem which can best be resolved in the context of the particular responsibilities and activities of each agency.

"I therefore recommend that the Congress enact legislation requiring each agency, within 120 days, to promulgate a code of behavior governing ex parte contacts within the agency specifying the particular standard to be applied in each

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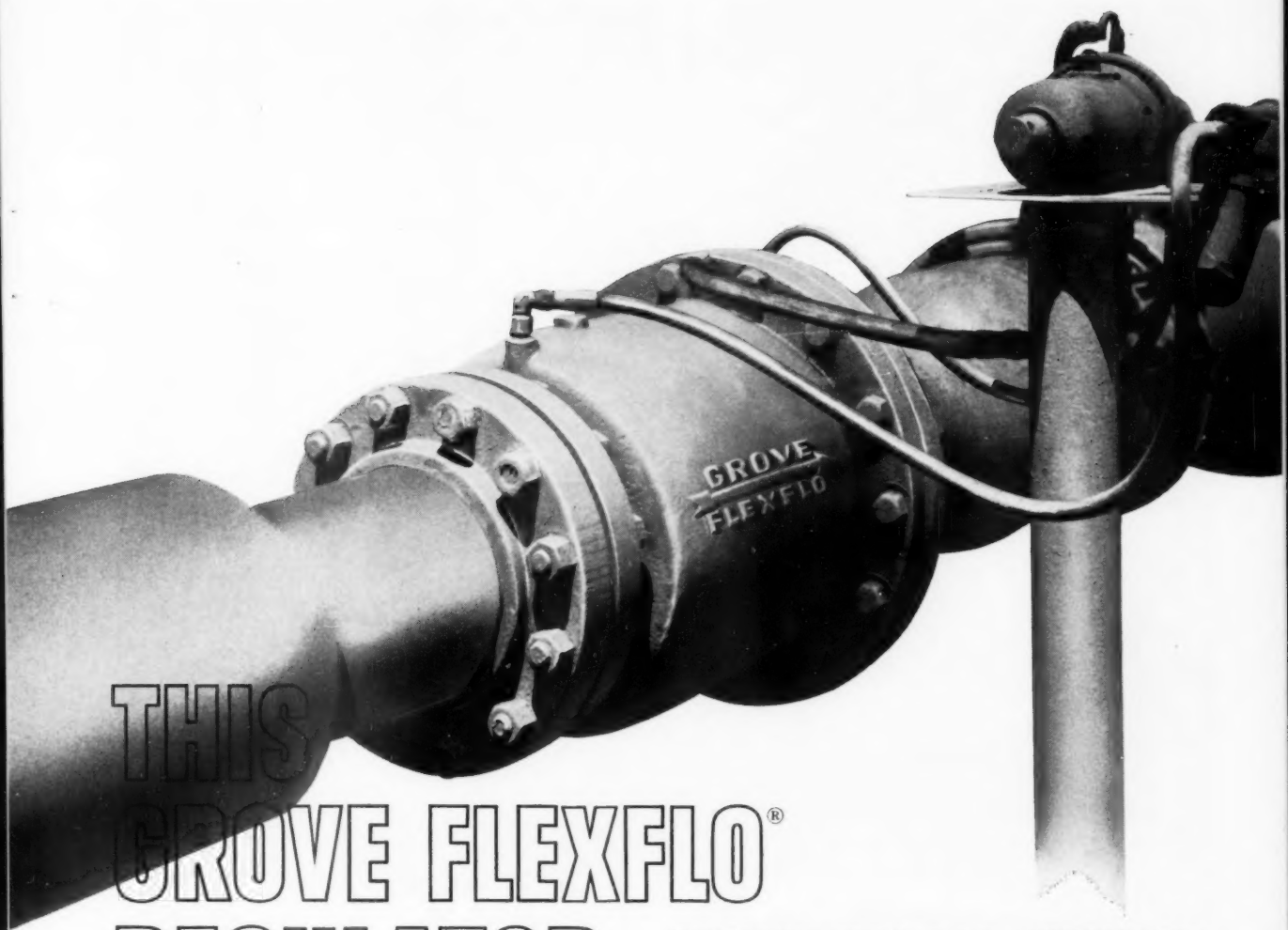

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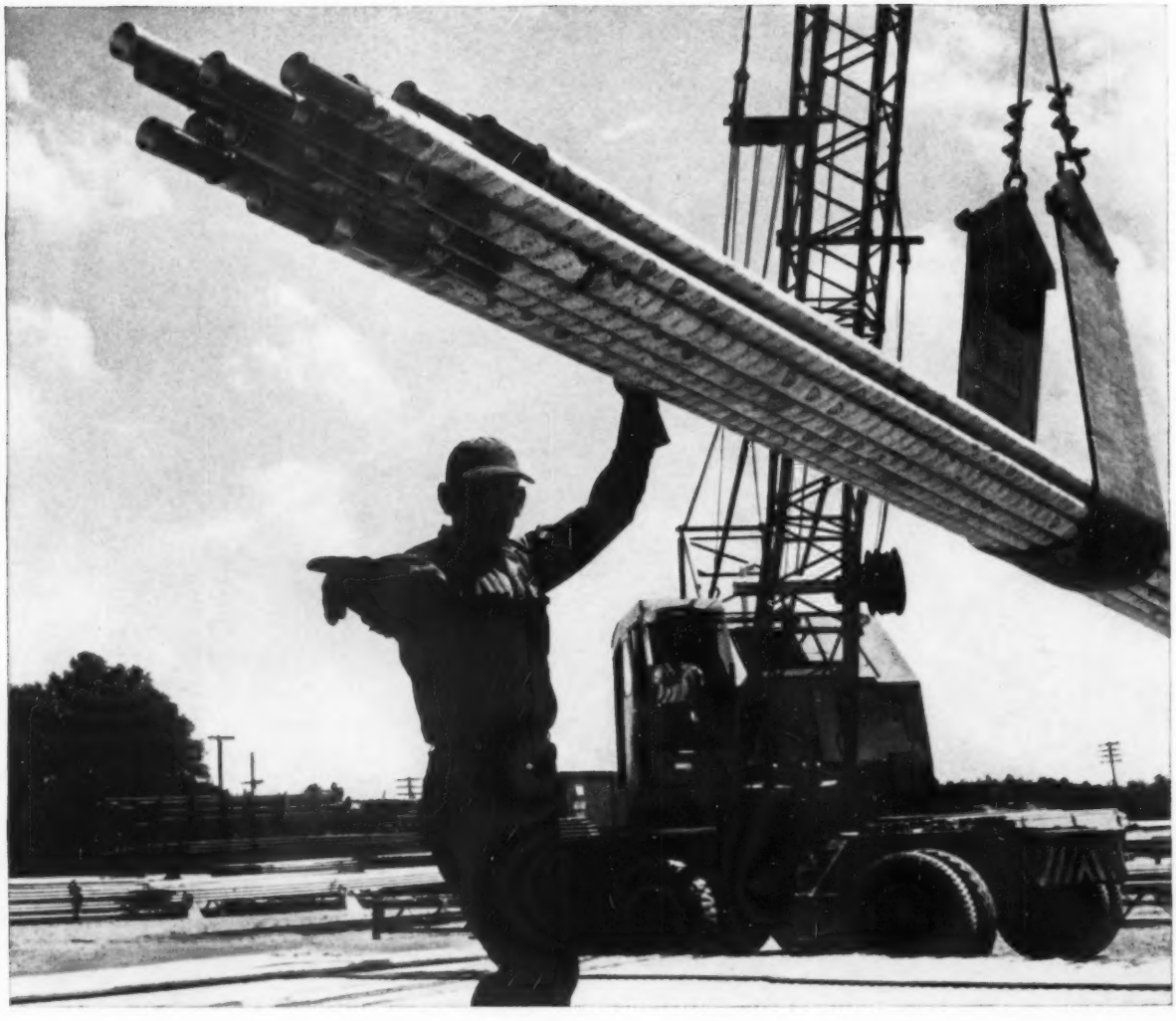

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TECHNICAL TRENDS

By GUY CORFIELD
Professional Engineer,
Los Angeles

Infra-Red Radiant Heating

The March 1960 issue of this page, under the title of "The Radiant Gas Burner," gave a general discussion of infra-red heat waves as emitted from gas burners designed for the purpose. It was stated that the traditional symbol of fuel gas combustion, the blue flame, was being challenged by the red rectangle or disc or cylinder or cone representing the various radiating surfaces of the infra-red gas burner assemblies. This challenge is still in effect—not perhaps as a symbol—but increasingly as a means of gas utilization. And, as ever, the electric radiant heater is also throwing down the gauntlet.

A number of different types of infra-red emitters, both gas and electric, are now commercially available. Of the gas types, the best known and probably the most widely used is the Schwank. It takes the form of a ceramic mat perforated with 200 holes to the square inch. A 100 per cent premix atmospheric injected gas-air mixture burns at the outer edge of these holes to produce a surface temperature of about 1600-2000 deg F. In other designs a porous (rather than perforated) ceramic plate is used, the combustible mixture being forced through the pores and burning at the outer surface. Another type uses nickel-iron screens to accomplish the same general effect. In one modification the gas-air mixture passes through two 40x40 mesh screens about ⅛ in. apart and burns at the outer surface of the second screen. It develops also a temperature of 1600-2000 deg F. Another use of nickel-iron is as a perforated sheet surrounding a conventional flame gas burner. The sheet is heated by radiation from the flame, and by the combustion products passing through the perforations, so that it becomes a radiator. All of these types are red surfaced and relatively high temperature emitters at their rated gas input.

There are also low temperature emitters. In one type, a conventional flame burner heats a porcelain enameled iron disc to a surface temperature of about 550-900 deg F and the outer surface of the disc radiates. In another type, non-aerated gas flows through an asbestos-fiberglass mat incorporating a catalyst. At the outer surface the gas combines with air to burn with flameless non-visible combustion to produce a radiating surface of about 650 deg F. At start-up the mat has to be heated to about 130 deg F for the catalytic action to commence.

The electric infra-red emitters are in three general types. The metal sheath heater is essentially a resistor embedded in electrical resistive refractory enclosed in a metal tube. Surface temperatures are relatively low. Input is about 50 watts per inch of ⅜-in. diameter tube. A quartz tube type encloses a coiled element within a fused air-filled quartz tube. Filament temperatures range from 1200-1800 deg F and input is normally 35 watts per inch of ⅜-in. diameter tube. The third type, the quartz lamp, has the coiled resistor filament sealed into an inert gas-filled, ⅜-in. diameter quartz tube. Filament temperature is considerable higher than that of the other two types. Input is 100 watts per inch of tube.

Except in certain designs of ovens where there may be radiation in several directions, all these types of heaters are usually used to heat objects or surface beneath them. Their practical efficiency therefore is the proportion of total heat input that is radiated downward. Relatively little is known—or at least published—on this efficiency of radiant heat emitters or even how to accurately measure it. The subject is being actively studied by both AGA and GAMA.

Electric infra-red heater efficiency is discussed in an article entitled "What Do We Know About Infra-Red Comfort Heating," by R. L. Boyd, Heating Division, Edwin L. Wiegand Co., in *Heating, Piping & Air Conditioning*, November 1960, page 133. The article compares high (above 2000 deg F) and low (below 2000 deg F) sources of radiant heat, referred to respectively as "near infra-red" and "far infra-red." It states that high temperature sources radiate over 85 per cent of their input as infra-red energy, and are best for heating dark colored objects. Low temperature sources radiate no more than 60 per cent of their infra-red energy, and are best for heating light colors or mixed colors. A sub-heading "What We Think We Know" appears to indicate that all factors of design and installation are not yet clear.

Another article, also in *Heating, Piping & Air Conditioning*, January 1961, page 231, is titled "How to Apply High Intensity Infra-Red Heaters for Comfort Heating." This 13-page section covers both gas-fired and electric infra-red radiant heaters. It deals principally with practical applications and makes no distinction between gas and electric units. The discussions are confined to "heater input" in Btu, and "radiant intensity" (which apparently means heat release for human comfort) in Btu per hour per square foot of floor area heated. It states that "Efficiencies of units available range from 30 to 60 per cent for gas-fired and low temperature electric sources for 80 per cent for the high temperature quartz lamp source." It does not give any information as to exactly what is meant by efficiency, or how it is determined; but presumably efficiency is considered to be the amount of effective heat radiated to and released at human occupancy level, divided by the heat input to the heater.

It seems rather obvious that this field of infra-red radiant heating is one in which the gas industry can and will take a leading part, and that it will become one of the most important general areas of utilization.

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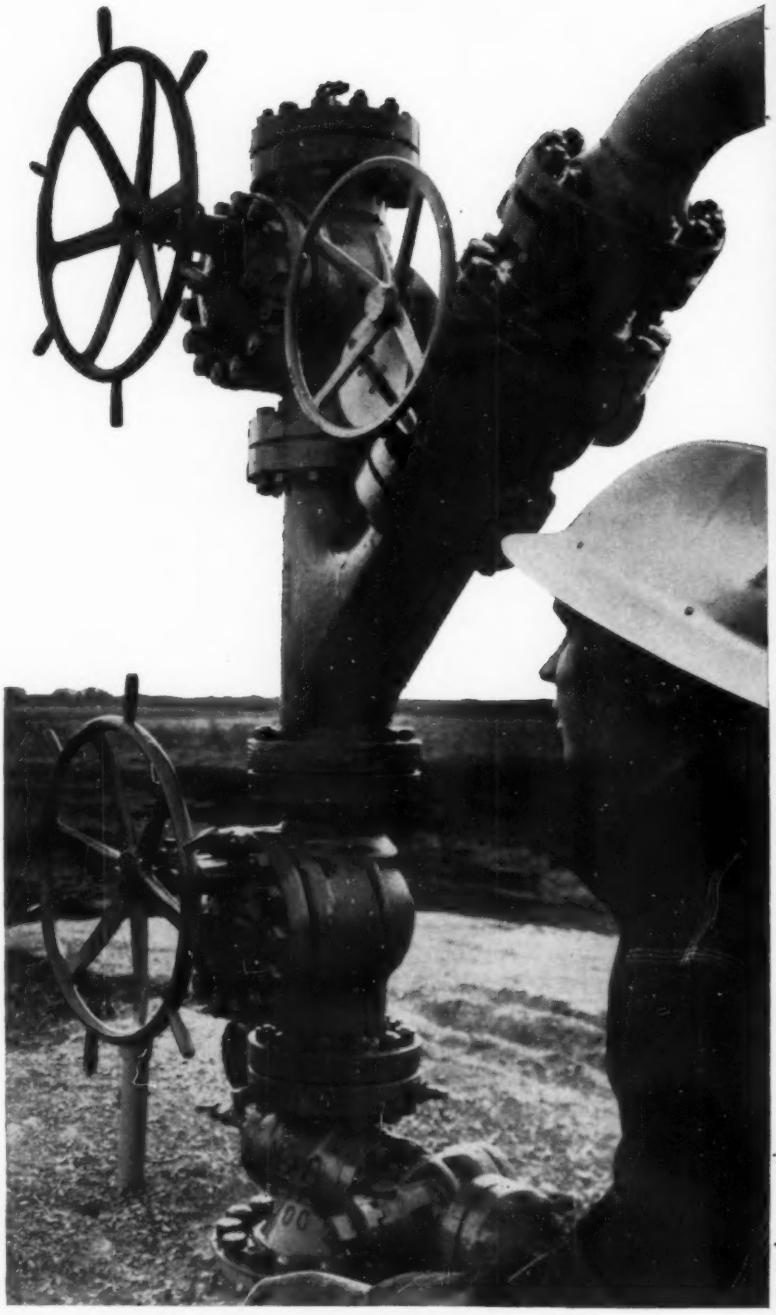

This National Supply unit was designed and built for a storage well of Northern Illinois Gas Company.

ARMCO National Supply Division

WASHINGTON

By NEIL REGEIMBAL • GAS Washington Bureau, Washington, D. C.

Tightening the screws

THE screws are being tightened on the natural gas industry. It was almost inevitable in the present makeup of the national government that long-flickering anti-gas fires would burst into flame with little delay. They have.

There's a good chance somebody will get burned before the fires are again under control. It may be this year, but more likely will be next year.

Most intense heat now is coming from proposals to tighten up the government's control of gas production and transmission. Principal fuel for this fire is a measure sponsored by Sen. Warren G. Magnuson (D., Wash.), chairman of the Senate Commerce Committee, and an even tougher measure sponsored by Sen. John A. Carroll (D., Colo.).

The Magnuson measure (drafted by the National Association of Railroad and Utilities Commissioners) would prohibit successive rate increases from becoming effective until pending ones were decided by the Federal Power Commission. This would outlaw alleged rate "pyramiding," and is strongly backed by so-called consumer interests, and has for the first time won the support of the FPC as well.

Other provisions of the Magnuson measure would formalize the present FPC ban on indefinite pricing clauses; permit the FPC to suspend rate changes involving gas sold for resale for industrial use; require the FPC to make a finding in certificate cases that initial prices are "in the public interest," and put a time limit on decisions by hearing examiners and the commission.

Sen. Carroll's bill is even tougher. It would require the FPC to give specific permission before any pipeline rate boosts could go into effect, abandoning the suspension provisions of present law, and authorize the FPC to require disputed rate increases be put in escrow to assure refunds to consumers if they are later denied. It would also permit the FPC to make rate increases retroactive, and give the commission the power to grant temporary rate increases in some extreme cases.

The commission told the Senate Commerce Committee that it supports the provision of the Magnuson bill prohibiting successive rate increases, but urged that this prohibition be limited to pipelines. It also supports the provision giving it the right to suspend rate changes in gas for industrial use, and the ban on some escalation contracts. It opposed the requirement that initial rates be found in the public interest, and the deadline on decisions. At the same time, it again issued a weak call for Congress to end utility-type control of the gas industry, but made no specific recommendations on how this should be done.

The hearings became a forum for bitter attacks on the gas industry, as most such hearings have. California Governor Edmund G. (Pat) Brown called present pipeline-FPC rate practices "extortionate" in a statement placed in the hearing record. Other California spokesmen also took pot-shots at the industry, as did witnesses from other states.

Friends of the gas industry in Congress, including Rep. Oren Harris (D., Ark.), chairman of the House Commerce Committee, have warned that there is a strong possibility of a bill similar to Magnuson's original proposal becoming law.

One effect of this would be to dry up investment funds, since a company might have to wait years before being allowed to offset rising costs with realistically higher rates. This, of course, would depress the entire gas industry.

It is apparent that the gas industry's foes—or supporters of "necessary stricter regulation of the industry," as they prefer to be identified—have stolen the march on the industry. They opened their hearings fairly quickly, and got their side of the controversy before the public, while the gas industry was still trying once more to get together and approve an industry-wide bill to ease the pain of regulation.

By doing this, the opponents have made it highly unlikely that any gas legislation now will stand even an outside chance of seeing light.

Backers of legislation favorable to the industry now can hope only to win a little bargaining power when the Magnuson bill, or any other gas legislation, comes to a head. There is a strong possibility that the Kennedy-liberal bloc bid to pass legislation to decontrol the small producers (selling 2 billion cu ft a year across state lines) will make headway with their proposal too.

There's no shortage of gas bills kicking around the halls of Congress. Rep. Harris has introduced seven major measures (none of them yet the industry's bill), most requested by the FPC. Sen. Magnuson has introduced some 20 bills,

Continued on page 88

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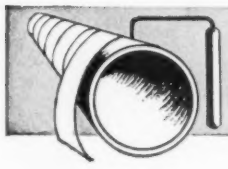

CORROSION PREVENTION

DISTRIBUTION
TRANSMISSION

What do you see?

By MARSHALL E. PARKER
Consulting Engineer, Houston

EVERY corrosion engineer should be a close observer of natural phenomena. He should also be an even closer observer of the works of man, for these can strongly affect his own work, for good or for evil. Much of what is seen is, of course, irrelevant. But it is very difficult to predict in advance what is important and what is not.

During a preliminary inspection of a newly constructed gas transmission line, before any tests had been run, the corrosion engineer chanced to notice a broken stud insulating sleeve lying on the ground at the location of a lateral tie-in. The insulated joint at that point was buried; the engineer was not informed as to whether the insulating material for the job had been furnished as individual parts or as complete sets. Still, the sight of that broken sleeve and its location stuck in his memory; and when, several months later, an attempt was made to run a current requirement test, the section showed an unexpectedly heavy current demand. The first thing checked was a point on the lateral, and it *did* prove to be shorted to the mainline. No one was surprised when excavation showed that the damaged sleeve had simply been omitted.

In another incident, an independent consultant was making a survey of a company's complete cathodic protection system. He was being assisted by a company employee, the same one who had been taking monthly readings on all the rectifiers in his district. Conversation lagged somewhat as the two men fought their way in to the site of one unit, over an apparently long-unused trail. There was no conversation at all while the engineer hacked and cut away the vines—some of them last season's dead ones—which had the rectifier completely wrapped and sealed. What would you say in your report?

A somewhat more complicated and unlikely case is that of the corrosion engineer, about to commence a system-wide survey of an existing cathodic protection system, who noticed a piece of cable in a pickup truck parked next to his car in a motel. It was recognizable as cathodic protection direct burial cable. Its scarred and shredded condition indicated that it had been wrenched violently from its place of burial. Two days later evidence was discovered that a newly constructed pipeline had crossed the anode cable of a rectifier; but all of the anodes were found to be working properly, as determined by a potential profile along the anode row. The owner of the new line was duly notified of the proximity of the line to an anode bed, and the current output was reduced in the meanwhile. However, since he indicated that he considered his coating to be good enough to take care of the problem, no steps were taken to move the ground bed.

A few months later, when the rectifier suffered a sudden drop in current output, the engineer still remembered that piece of cable in the truck. A little shovel work at the site brought to light the fact that the cable had indeed been cut by the ditching machine; the contractor had then patched it by splicing in a piece of cable not suitable for direct burial, and had done an inadequate job of protecting the splices, with the normal result of an early failure. It should be reported that the ground bed was eventually abandoned, before serious damage was done to the new pipeline; such damage is very difficult to avoid when the exposure to anode gradient is as severe as in this case.

A happier instance of observing a pertinent feature of the environment concerns a survey which was being made for the purpose of placing a new line under protection. The ideal location for a rectifier lay in a relatively short stretch of readily accessible low-lying ground, favorably situated near the middle of a line section, and remote from other pipelines—but unfortunately also remote from power lines. The engineer had not even taken the trouble to make soil resistivity measurements because of this lack of power; but as he was about to leave the area he noticed a stake by the roadside, about two feet from the fence line. A few hundred feet away he found a similar stake; and, ultimately, a whole row of them, equally spaced, stretching for a distance of three miles—and ending at the end of an existing power line!

This looked so promising that he went back and took his resistivity measurements before leaving the area, and found them quite satisfactory. When he checked in with the power company, he found that a new power line was about to be built, and would in fact be in service within a month—which was faster than he would be able to get his system installed.

The total pertinent environment of a corroding, or potentially corroding, pipeline is truly vast. It includes all of the soil lying within miles of the line (there is no definable limit, but cathodic protection currents can be detected ten or twenty miles from their lines); it includes all of the lines which cross it, and the cathodic protection systems attached to them; it includes crossing and parallel railroads, and their signal systems; it certainly includes any possible source of stray current for a very

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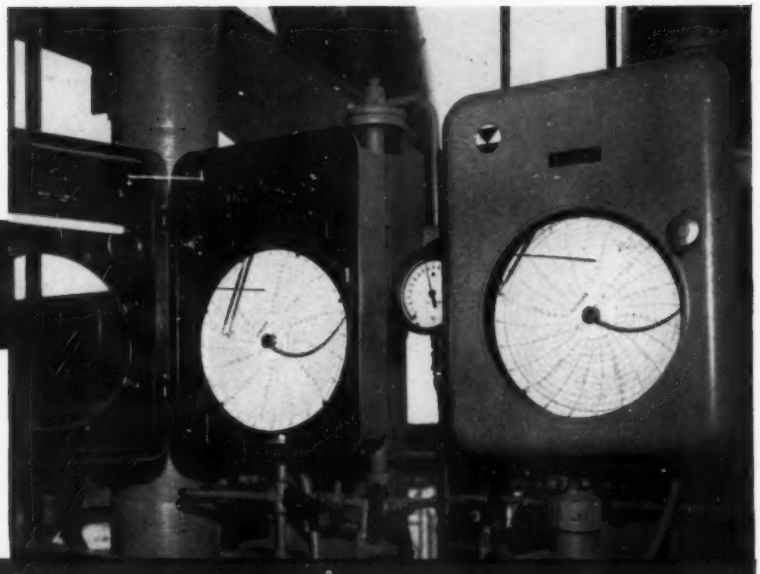

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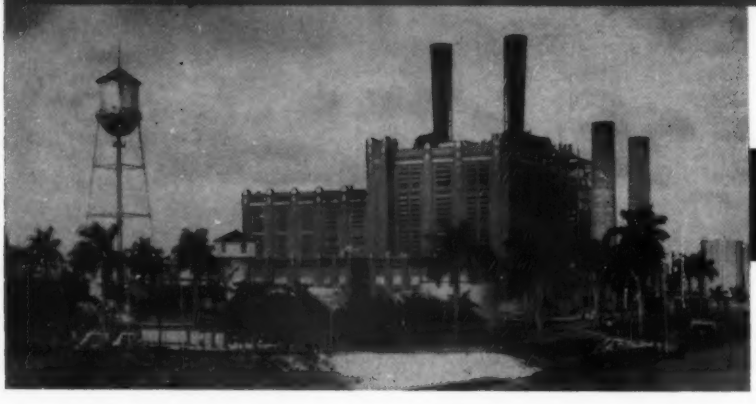

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THE GASSING GAME

By **JIM CLARK** • Gas & Oil Consultant, Houston

IF members of the Federal Power Commission and its staff would get into the field and become acquainted with problems of the producers and transporters of natural gas they would be in a much better position to render intelligent decisions.

This point was made fairly clear recently by Mills Cox, president of Transwestern Pipeline Co., during his talk at the dedication cere monies for his company's line at Roswell, N. M.

"I regret," Cox said, "that representatives of the Federal Power Commission and other equally important agencies were unable to attend our functions due to hearing schedules and other circumstances. . . .

"Our regrets are expressed from two viewpoints. First it was our sincere desire to have as our guests representatives of these agencies so they could see first hand the results of decisions that were made to enable us to be in operation. And second, and to me more important, is that I personally feel that commission members and staff members of the regulatory agencies should be given more latitude and that there should be a more forward-looking approach, both as to time and funds whereby these public servants could see and learn first hand more of the industry for the regulation of which they are responsible," Cox said.

"From my own experience, I would urge this action to be taken, for it must be difficult for attorneys who have never seen oil and gas operations to prepare and ask questions for engineers and technical representatives who likewise have not had first-hand knowledge of the matters on which they are conducting hearings. By this I am not critical of the practices. I simply feel that there is a greater area for a better working knowledge to be gained from first-hand information and contact," Cox said.

What Mills Cox advocated in expressing regret at the absence of FPC people at a ceremony in which he had great pride is understandable. It is ridiculous for the government to expect performance and responsibility from commissioners and staff members who know so little about the industry they regulate. As Cox seems to suggest, the government should provide funds for these men to get out into the field and see the problems first hand. Maybe they should not attend ceremonies and there is considerable question about commissioners visiting with the regulated only on occasions of meetings and conventions. But they should all get into the field and see a gas well, a pipeline, a booster station and other facilities both while drilling and under construction as well as in operation. They should meet and know the men who man these facilities and at least learn the language of the business.

If they did that there would be less time lost in considering applications. Better and more intelligent, and even more honest, decisions and orders would result. The consumer would be served better and the taxpayer would be getting his money's worth for the services performed by FPC people.

Mills Cox said he intended no criticism. He didn't. There are few men in the natural gas business today as sympathetic with the FPC and its staff members as Cox. He recognizes their problems and understands why some of their decisions are subject to question. He defends the commission and its staff members even when they make questionable decisions. He is one man who believes that the producer will never be able to get free of regulations and for that reason he advocates good regulation as opposed to the mediocre and confused and even frustrated regulation that so often develops from a lack of knowledge.

Undoubtedly the public does not realize that most members of the FPC and its staff know so little about the gas industry. If the public were aware of the facts, it is likely that some changes would be made. After all, regulation is supposed to be in the public interest. It simply isn't possible for uninformed men to regulate the thing they are uninformed about.

Commission members can no more make an intelligent decision about the gas business from textbooks, charts and graphs than a doctor can operate from a guide book, or a CAB member approve a plane or a route without getting out of Washington, into the plane and along the route to be approved.

FPC members and staffmen should not simply be permitted to get into the field as Cox suggested. They should be forced to do so as often as possible and practicable. ■

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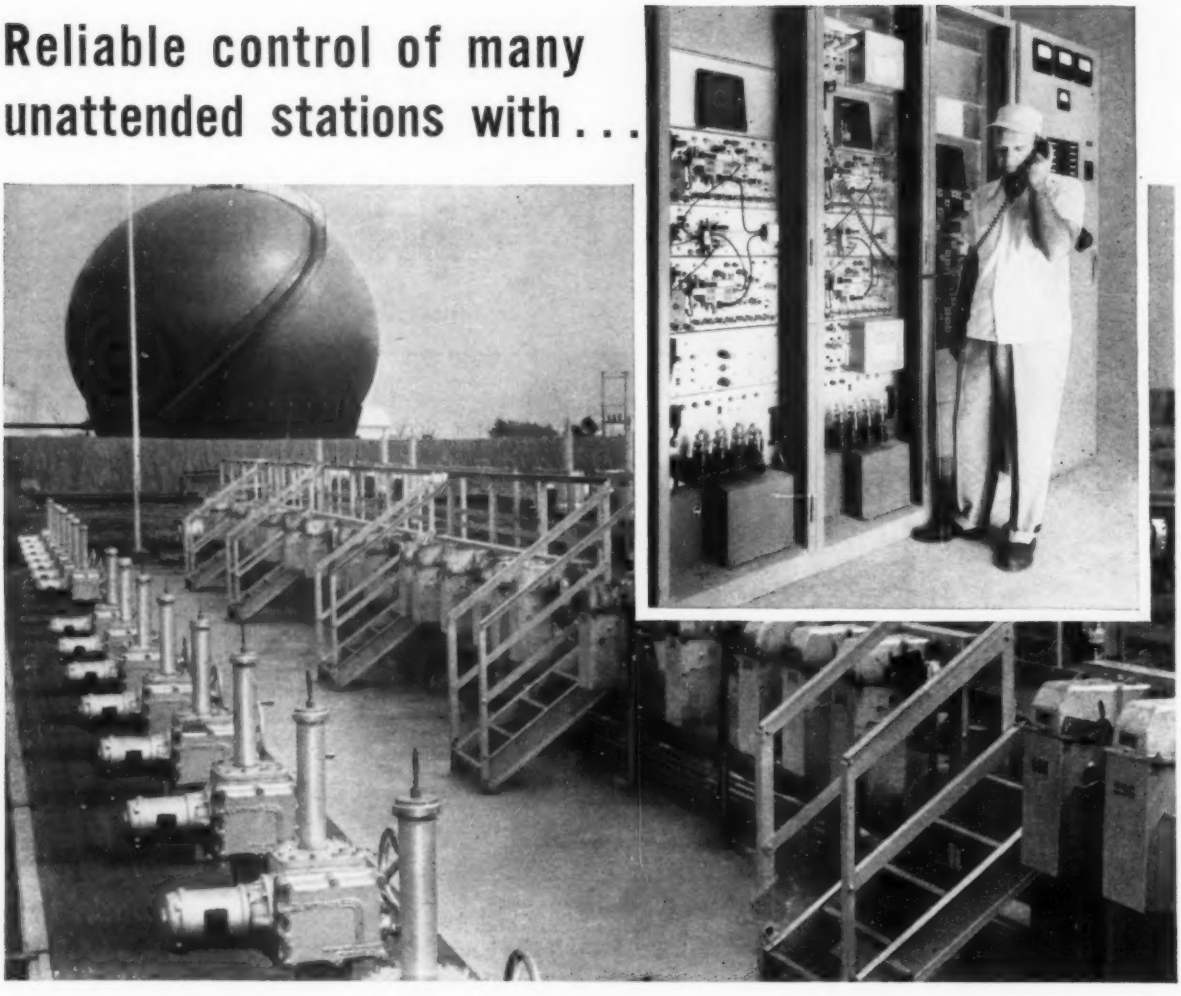

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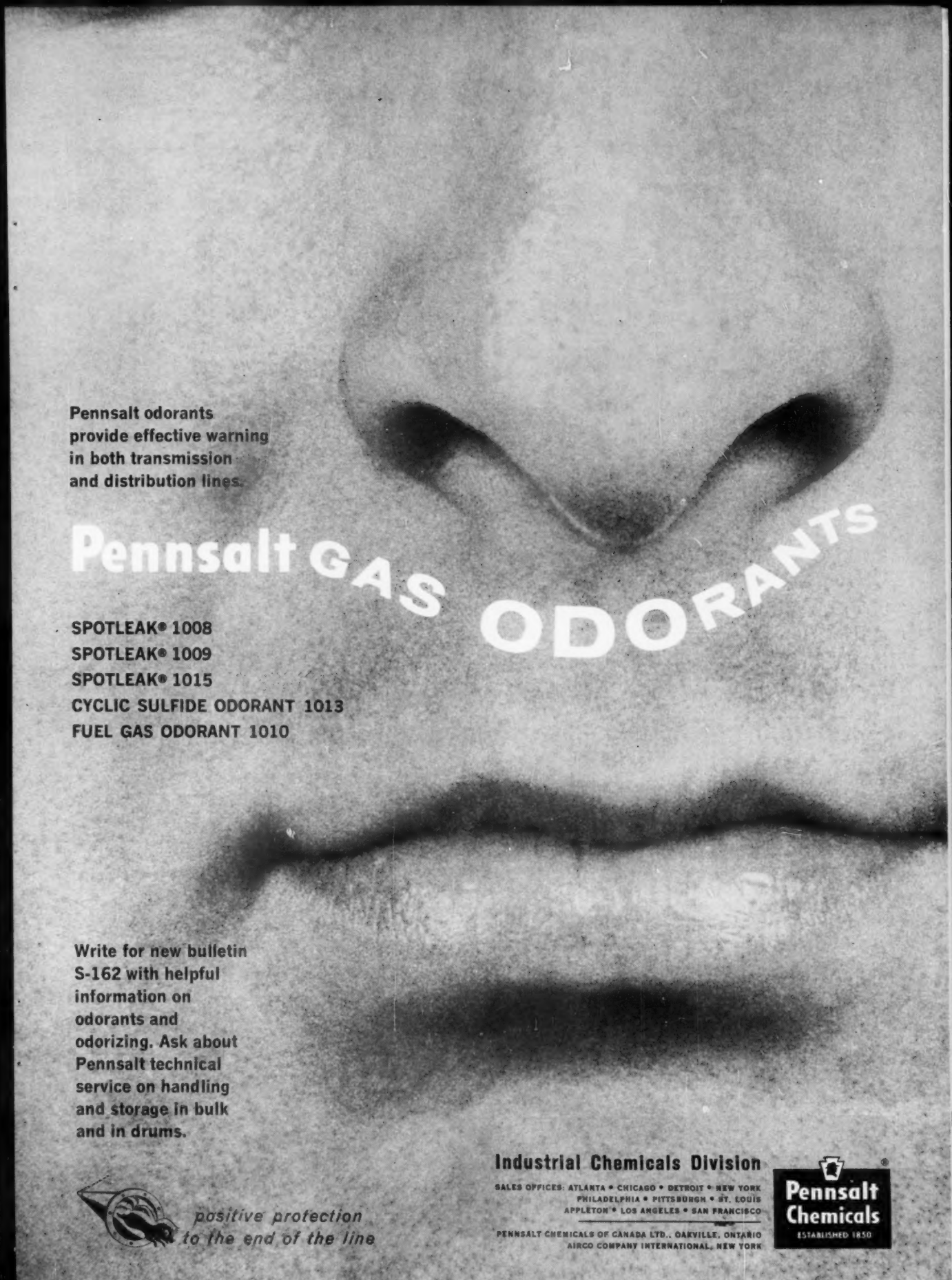

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There are a lot of other advantages in these Line-Mounted Gas Meters, too. You can easily read total flow through the convenient protective lens of the direct-reading volume register, yet the register itself is enclosed entirely within the meter case, eliminating problems incurred with external counters. And if you wish, the meter can be easily instrumented. Maintenance is simple: just replenish the oil occasionally; convenient bulls-eye oil-level gauges make checking easy. There are no internal valves, orifices, or diaphragms to wear or be damaged, and no stuffing boxes to maintain. Testing is easy too, with simple connections provided for standard proving procedures.

Whether your problems are in gas production, transmission, or distribution, or if you meter industrial or institutional gas, you'll find Line-Mounted Rootsmeters the most accurate and dependable, easiest to install, and most convenient gas meters you've ever used. Call your Roots-Connersville engineer or write for details of all the advantages of new Line-Mounted Rootsmeters.

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A NEW SYMBOL OF QUALITY

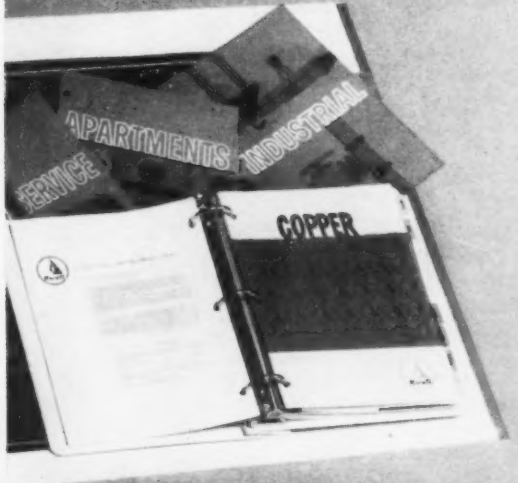
Ruud has a new trademark! It is a symbol of quality. It is a promise to continue a tradition, which began more than 70 years ago, of manufacturing water heaters and other products of the highest quality. The new Ruud trademark represents a dedication to search continuously for better materials and better ways of making water heating equipment.

A NEW STANDARD FOR THE INDUSTRY

You'll find the new Ruud trademark on the improved line of Copper Sanimaster Gas Water Heaters. Each model features a solid copper tank reinforced with steel for strength. Copper construction effectively resists the corrosive effects of hot water, resulting in longer water heater life. All models are self-contained, underfired, automatic storage water heaters. This compactness saves valuable space and permits point-of-use installation.

Ruud Copper Sanimaster Commercial Gas Water Heaters carry a five year warranty. If the tank should leak during the first three years, Ruud will provide a replacement heater. During the fourth and fifth year, a replacement heater will be provided at a pro-rated cost. Nine Copper Sanimaster models assure perfect application sizing, regardless of specification demands.

A NEW ENGINEERS' MANUAL AND SIZING GUIDES



A NEW ENGINEERS' MANUAL AND SIZING GUIDES

Complete information and specifications on Ruud Copper Sanimaster Commercial Gas Water Heaters are contained in the new Ruud Engineers' Manual.

It includes revised Sizing Guides covering 23 different use-classifications. These Certified Sizing Guides provide accurate, quick, specification information for every application.

Write today on your company letterhead for the Ruud Copper Sanimaster Gas Water Heater Brochure, and find out how you can obtain a complimentary copy of the new Ruud Engineers' Manual.

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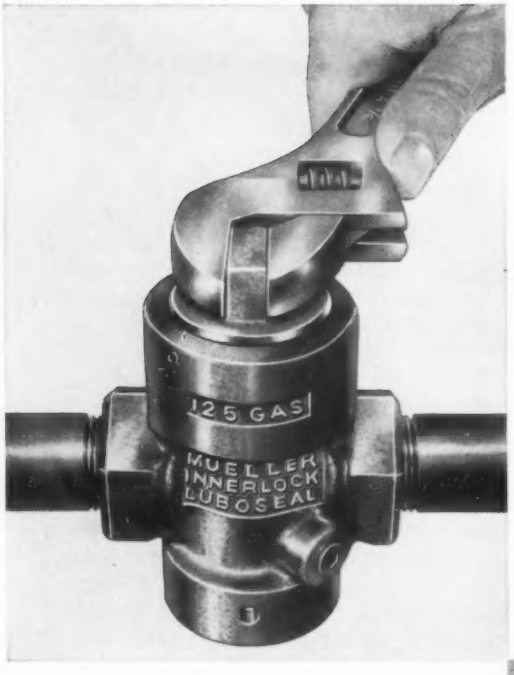
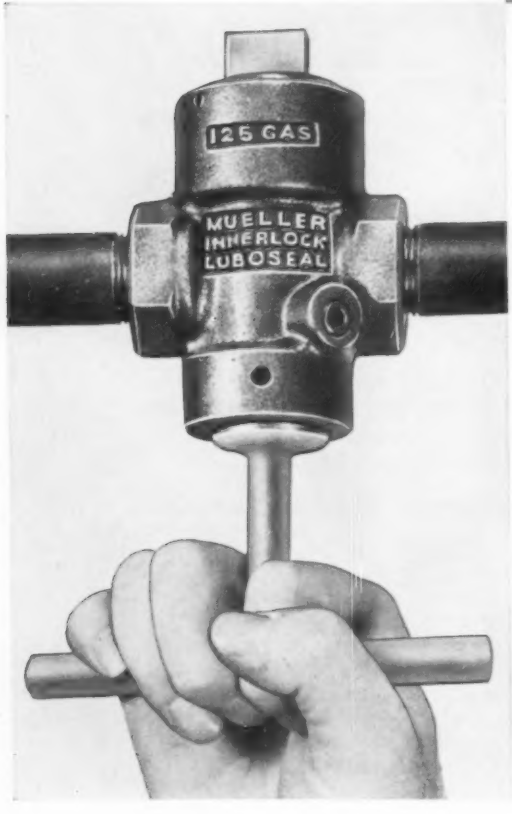
Subsidiary of Rheem Manufacturing Company
Manufacturers of a full line of the highest quality commercial and residential gas water heaters.

now, positive control of home service turn-ons...the



anybody turns it off

The customer can quickly and easily turn this stop off with a common wrench. But he cannot turn it on with any tool normally found in the home. This unique stop simply and effectively prevents the customer from creating a dangerous situation in the home.



Gas company turns it on

When the gas company employee knows it is safe to do so, he quickly restores service with a special wrench available only to the gas company. Opening the stop automatically resets the stop for future shut-off use.

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another LubOseal *gas meter stop*

■ You can be certain that you are installing an absolutely safe gas stop when you install a Mueller LubOseal stop. The many advanced features found in all LubOseals assure you that many years from now it will be just as safe and dependable as it is today.

GAS TIGHT – O-ring seals at top and bottom of key absolutely prevent leakage to the atmosphere. Precisely ground key is lapped into body to prevent leakage through port. False ports in key and body protect generous sealing surfaces.

EASY TURNING – Four vertical grooves in key distribute grease over *all* sealing surfaces each time stop is turned off or on. Grease is stored under pressure by O-rings for perfect lubrication over long periods. Independent port permits easy relubrication of entire stop.

FULLY TESTED – Each stop is individually tested before shipping in both "off" and "on" position by submerging in non-corrosive liquid and applying 125 p.s.i. air pressure.

Iron Body—Bronze Key
Straight Way
Flat Head
Tamperproof
Working Pressure to 125 p.s.i.
Size—¾" only

H-11190 Innerlock LubOseal Stop
Inlet: Inside I.P. Thread
Outlet: Inside I.P. Thread

H-11191 Innerlock LubOseal Stop
Inlet: Inside I.P. Thread
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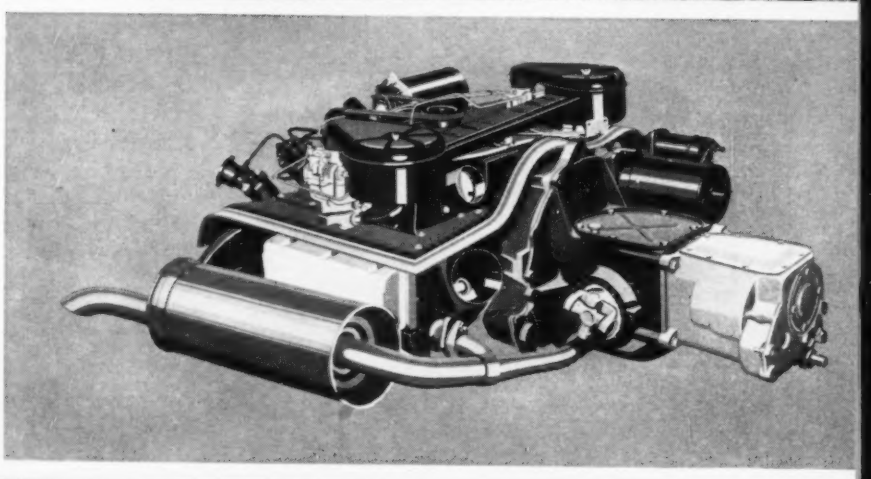
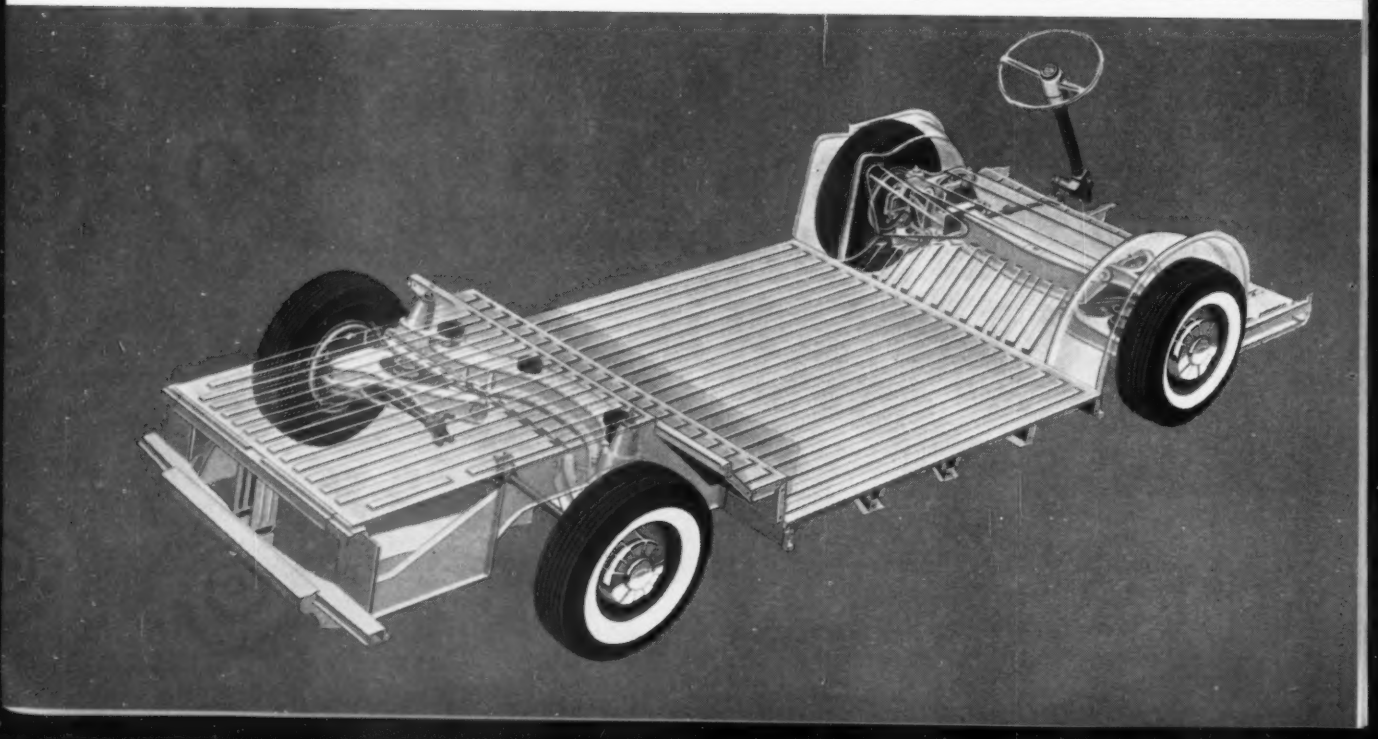




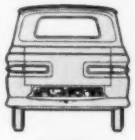
THERE'S A DOLLAR-SAVING DIFFERENCE IN CORVAIR 95!

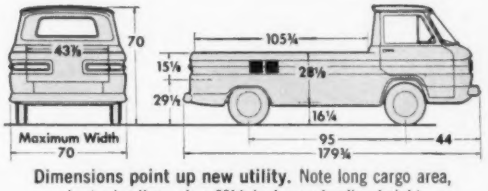
We mean there's a whopping difference—the kind that puts a truck in a class by itself. You can see it, too, especially if you know where to look. In Corvair 95 design details, for instance—the things that tell you a truck is built with care throughout, crafted in a quality way that means more miles before trade-in and less expense along the route. We mean it's the kind of difference that will pay off in dollars every day on your job!

Power team and driver compartment—evidence of extra efficiency. Tucked neatly between the rear wheels is the most practical truck-design idea in years—the Corvair 95 *Unipack power team.* Engine, transmission and rear axle are combined in one compact, *durable* unit. Power is delivered to the rear wheels by the shortest, most efficient route. This unitized power train design (including an engine that measures only 17" high) takes up less space—allows for plenty of cargo room in the big pickup body. The engine itself is something new in save-as-you-go power: a tough aluminum air-cooled 6 that moves your loads briskly on a minimum of gas. Up front, the big difference in Corvair 95 design is apparent in a cab that gives you bird's-eye visibility (no hood to limit vision), plenty of leg room, and a comfortable full-width foam cushioned seat (standard equipment).

Exclusive side loading ramp—Rampside models. Wide, ruggedly built side gate drops down to form convenient ramp for easy no-lift loading.

Engine access door speeds up servicing—gives fast access to oil filler, distributor, coil, generator and oil filter.





Dimensions point up new utility. Note long cargo area, short wheelbase, low 29½-inch rear loading height.

Corvair 95's stay-together build goes unchallenged in this field.

Super-rigid frame-floor assembly outperforms combination of separate frame and body floor. Eliminates a major part of a separate frame's weight.

Heavy-gauge crossmembers strengthen the underbody; form rigid foundation for front and rear suspensions—another reason for long truck life.

Friction-free coil springs at all four wheels assure top load-carrying capacity and *smooth* ride.

Precision Ball-Gear steering cuts friction (and wear) to a minimum; gives safe, easy steering.

Unitized body construction means maximum strength with minimum weight—for bigger cargoes.

There are literally scores of reasons why no other truck of this type can do so much to put you dollars ahead. There's a cargo area that's almost 9 feet long . . . with balanced weight distribution that enables a Rampside or Loadside pickup to carry up to 1,900 lbs. of payload with a 4,600-lb. GVW. There's a short 95-inch wheelbase for nimble maneuvering; deep-biting traction with engine weight in the rear; handsome styling that's good for business.

That's Corvair 95's special brand of *efficiency,* ready to give you bigger profit hauling in the years ahead. See for yourself at your Chevrolet dealer's. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

1961 CHEVROLET STURDI-BILT TRUCKS

CHEVROLET

Just the ticket for those INDUSTRIAL and COMMERCIAL jobs!

MODEL 461

Screwed end 1½"-2"
Flanged 125 lb. 2"
Max. Inlet Pressure 125 psi
Outlet Pressure Range
12" diaphragm ounces to 5 psi
8½" diaphragm 3 to 10 psi
Typical Flow Rate
5 psi inlet 12000 CFH
20 psi inlet 25000 CFH
50 psi inlet 48000 CFH

CHAPLIN-FULTON Pressure Regulator

Spring Loaded
Weight Loaded
Pilot Loaded

Model 461-S
Model 461-W or DW
Model 461-PG, PA, DWP

ACCURATE!
VERSATILE!
FOOLPROOF!

A compact self-contained economical regulator designed to satisfy 90% of your commercial and light industrial regulator requirements.

For distribution use, it steps up the pressure as the demand increases to deliver gas when you need it.

For safe accurate regulation of large volume commercial or industrial services, use Model 461 as a monitor regulator with Model '1100' as the control regulator. Most of the parts interchange. Both are compact, accurate and versatile.

Bulletin 461 gives complete information.

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* . . . for the "business end" of the Gas Business!

In a MODERN NEW PLANT we now are producing the new ***Arkla V-250 Gas Meter.*** *Efficient, compact and streamlined, this new meter is built for long life. Aluminum parts are specially treated against corrosion. Two coats of enamel are baked on the exterior—exclusive with the* ***Arkla V-250!***

Tested and proven before shipping, the ***Arkla V-250 Gas Meter*** *is ready to go to work for you at the business end of the gas business—the customer service line.*

ARKLA

ORDER ARKLA V-250 GAS METERS TODAY—*Write, wire or phone:*

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BROADER WARRANTY
GREATER ECONOMY AND DURABILITY
'61 FORD TRUCKS

The new extended warranty for all 1961 Ford Trucks is just one example of the many ways Ford gives you maximum protection for your truck investment. Each part, except tires and tubes, is now warranted by your dealer against defects in material or workmanship for 12 months or 12,000 miles, whichever comes first. Warranty does not apply, of course, to normal maintenance service or to the replacement as normal maintenance of such items as filters, spark plugs and ignition points.

The excellent fuel economy of Ford's modern 223-cu. in. Six has been proved in certified tests by independent experts over a 3-year span. Front tires on Ford conventional ½-tonners also lasted up to twice as long as those on other makes with independent suspension.

In addition to price, fuel and tire savings, 1961 Ford Trucks provide greater freedom from nuisance problems that crop up with other trucks. Ford's rigid quality controls give you the strongest safeguard of truck reliability ever. Fords stay on the job . . . out of the shop!

F-100 Chassis-Cab models have new stronger frame for greater durability and longer wheelbase for smoother ride. 28% more glass area in cab gives you new wide-angle view to front, sides and rear.

New Econoline Van . . . modern cab-forward design gives as much as 80 more cubic feet of cargo space in nearly three feet less length than leading conventional half-ton panels. It's America's lowest-priced* van and can cut yearly operating costs by $100 or more.

New 4-wheel drive pickups . . . priced to save you plenty, Ford's 4 x 4's come in ½- and ¾-ton capacities. They're tougher than ever with stronger frame, improved suspension and new optional heavy-duty front axle on ¾-tonners.

*Based on a comparison of latest available manufacturers' suggested retail prices

ALL-NEW
FORD "BIG SIX"
262-cu. in. engine

Now, the economy of a Six is combined with the dependability of heavy-duty, exclusive-truck engine design. In independent tests, Ford's new Big Six was pitted against the major competitive Six. Certified† result: Ford Trucks gave 13.5% better gas economy! And Ford recommends 34% fewer service operations in 25,000 miles of customer service. This means less time in the shop . . . more time on the job.

The new Big Six is one of four engine choices in Ford F-600 trucks for '61—including America's most popular truck V-8's.

†*Tests simulated typical city delivery and shuttle service*

FORD TRUCKS COST LESS

SEE YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" FOR PROOF!

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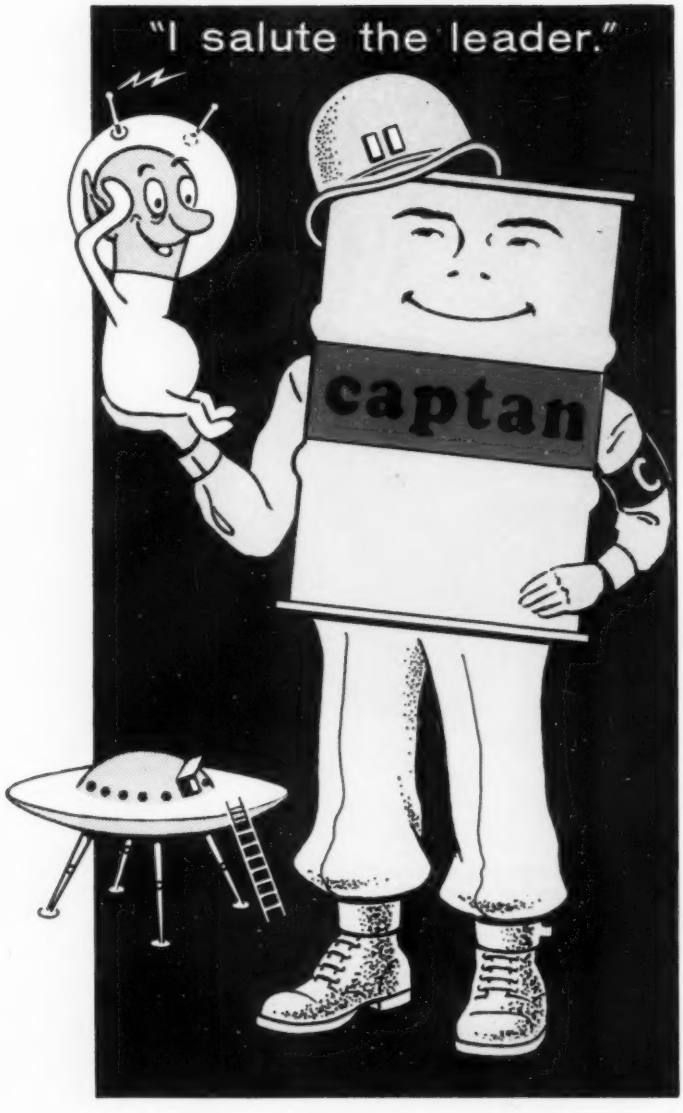

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More gas is odorized by CAPTAN PRODUCTS than by all other odorants in the world combined. That is real leadership.

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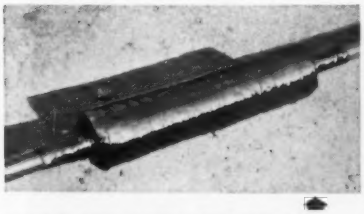
TAPECOAT® PROTECTION...

Works for You Anywhere!

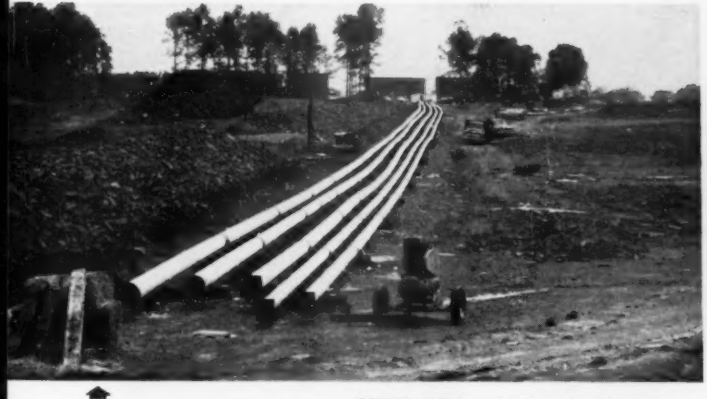
NATURAL GAS lines at compressor and meter stations give years of maintenance-free service when protected by TAPECOAT, the coal tar coating in handy tape form.

GAS DISTRIBUTION lines of large diameter can readily be protected with TAPECOAT to withstand the abrasive and corrosive climate in underground service.



CABLE AND CABLE SPLICES in communications service are effectively and economically protected by TAPECOAT.

Lines in **OFF-SHORE DRILLING** operations need joint protection equivalent to the mill-wrapping on the pipe. TAPECOAT is most economical because it gives lasting protection in underwater service.



AIRPORT FUEL LINES need the quality joint protection assured by TAPECOAT. It is easy to apply by spiral or "cigarette" wrapping depending on the size of the pipe. No training needed.

UNDERGROUND GAS STORAGE facilities can be "buried and forgotten" when protected by TAPECOAT. Note protection of tanks, pipe and pipe joints.

STEEL MILL water lines in this new plant are joint-protected with TAPECOAT. TAPECOAT can be used to advantage to protect any steel surface in underground service, as proved since 1941.

Lines buried in cinders in **RAILROAD YARDS** need the sure protection provided by TAPECOAT. There's a size for every purpose from 2" to 24" in width.

Write for full details today

The TAPECOAT *Company*

Originators of Coal Tar Coating in Tape Form

1535 Lyons Street, Evanston, Ill.

Manufactured and Distributed in Canada by
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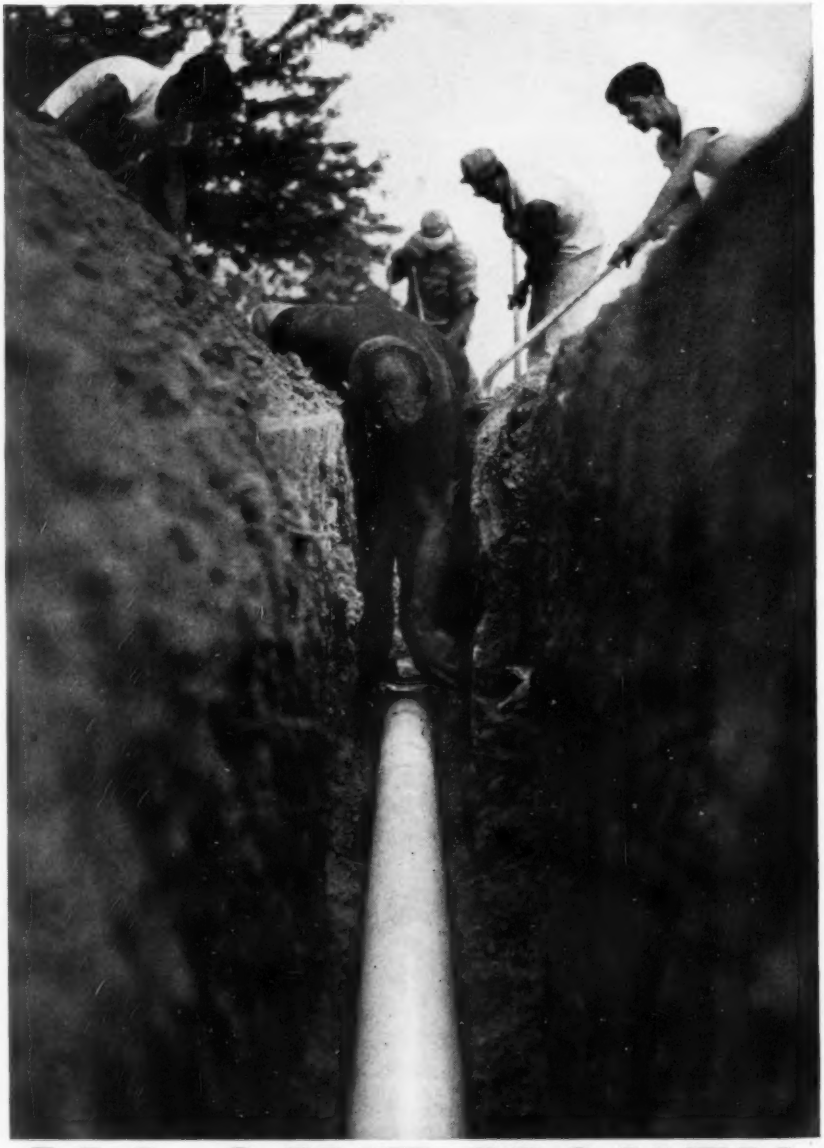
You need no elaborate testing equipment, either. A pail of soapy water is all you need to check out the completed joint. Once it's soap-tested, it's checked... it's as simple as that. And, of course, the only tool you ever need is a wrench. Sizes 2 to 12 inches. Style 423 long sleeves available.

ALL SAVE TIME

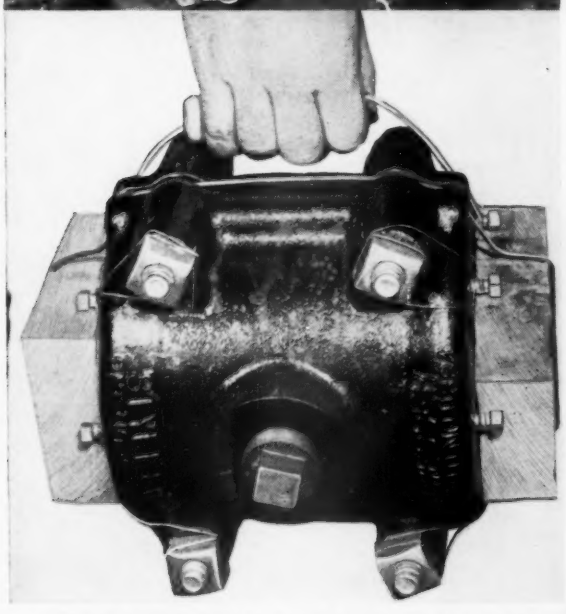
DRESSER® STYLE 123 COUPLINGS Save... save... save with the Dresser Stab-Clad® Style 123. The factory-assembled pre-coated coupling that makes it a black day for corrosion. Complete assembly gets 1, 2, 3 coating protection **at the factory**—Red-"D"-Shopcoat primer, coal tar epoxy resin, and coal tar enamel. Integral bond wire guarantees electrical continuity. 123's give corrosion its toughest fight. They're fast, too. Pipe ends just stab in. And tightening the bolts completes the job. No time wasted on priming and coating hard to get at places. You install the Stab-Clad coupling right out of the factory carton. Touch up (only if you want to) and protection is complete.



ALL SAVE MONEY

Save... save... save with Dresser® couplings and pipe repair products because they're developed specifically for the gas industry... with problems of costs, speed, and simplicity given prime consideration.

Ask your Dresser man for information on any component or all of the complete Dresser line. The Gas industry is his only business. You'll find him well qualified, and eager to help you in any way he can. DRESSER MANUFACTURING DIVISION, 61 Fisher Avenue, Bradford, Pennsylvania.



ALL SAVE WORK

DRESSER STYLE 60 BELL JOINT CLAMPS Save... save... save with Dresser Style 60's. Boosting main pressure often means clamping thousands of old bell and spigot joints made up to as long as a century ago. Dresser Style 60 clamps prove the most effective way to make leakproof joints for decades more. Dresser gaskets are of the proper durometer, hard enough to seal and soft enough to pack—and are wide enough to cover every pipe size you're liable to encounter—even the oddest. In a typical operation a good crew can install 12 Dresser Style 60's in a day... and those joints are gas-tight **permanently.** Sizes 3 to 60 inches.

DRESSER STYLE 80 READY-PACK SLEEVES Save... save... save with Dresser Ready-Pack Repair Sleeves. Repair cracked CIP mains in under 10 minutes at any hour, day or night. No loose parts, no gaskets to trim or fit. And they double as tapping sleeves, too! Take a Ready-Pack Sleeve, one man, a few minutes of action, and you've got a permanent, gas-tight seal... even on offset pipe. And you even get the wrench packed with the unit. These versatile repair sleeves pay for themselves many times over in shortened traffic tie-ups, short service interruptions, and less service crew time. Style 80 sizes 2 to 8 inches.

ANOTHER DRESSER THREE-WAY SAVER

Dresser "UTIL-SEAL." A complete epoxy resin repair kit with unlimited uses on pipe joints and fittings plus tanks, valves, and tubing. Inexpensive, fast, easy to use. Carry one on every truck for emergencies, or, where a clamp can't be used.

dmd DRESSER
MANUFACTURING DIVISION
BRADFORD, PENNSYLVANIA

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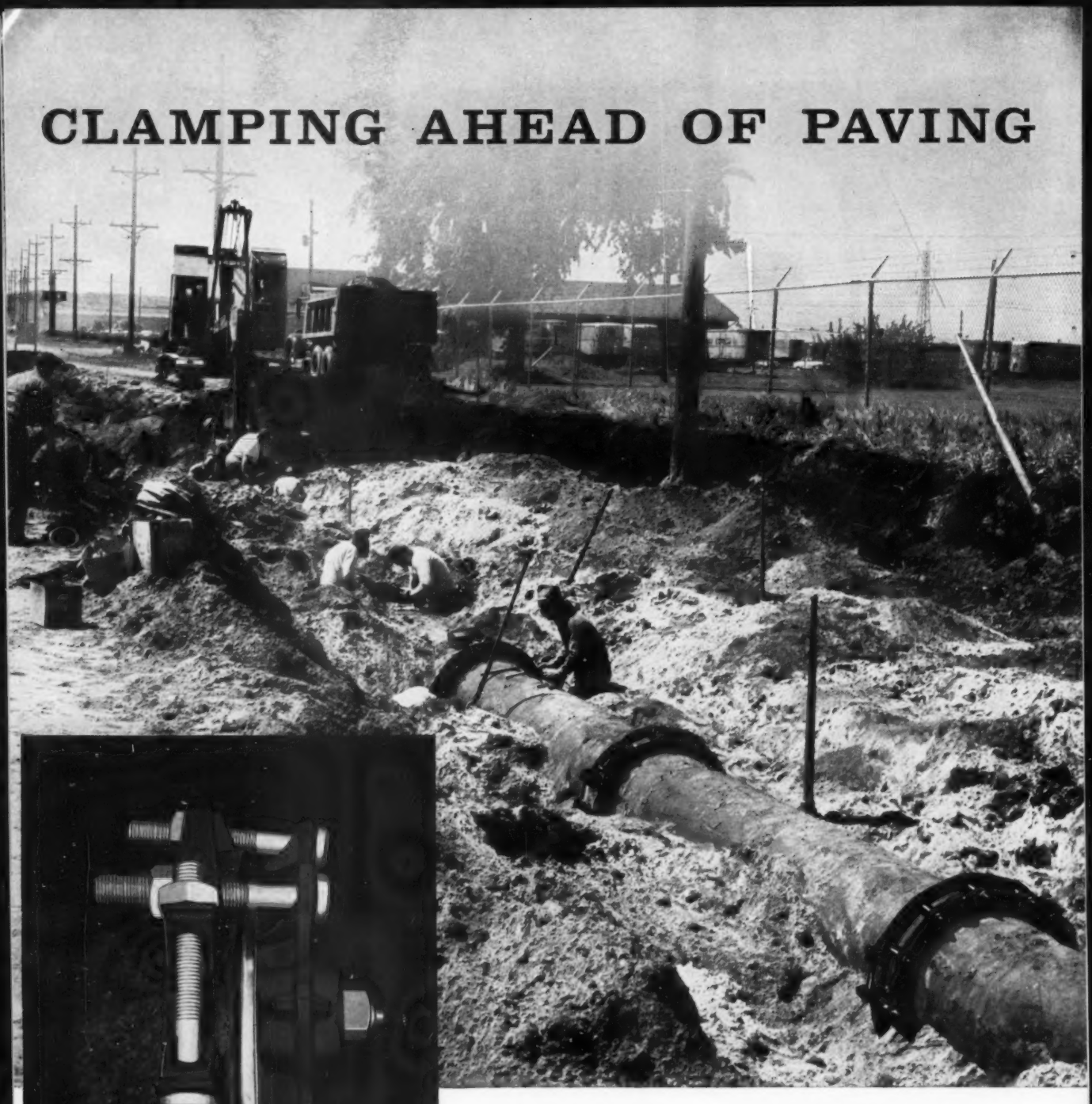
SERVING THE GAS INDUSTRY HAS ALWAYS BEEN OUR BUSINESS

CLAMPING AHEAD OF PAVING



More and more, clamping bell and spigot joints ahead of paving is becoming standard practice around the country.

When you clamp with the Skinner-Seal Bell Joint Clamp, you get massive malleable iron construction, gasket sealed by stainless steel band, oversized (¾") pull bolts.

For over 50 years, our clamps have been built for permanence. Every detail of design and construction is worked out with that in mind.

M. B. SKINNER CO., SOUTH BEND 21, IND.

SKINNER-SEAL BELL JOINT CLAMP

GAS

JULY 1961

The Federal Power Commission

The Federal Power Commission in recent years has been under increasing criticism. At the same time, as a result of various court decisions, its work load has grown tremendously and the web of regulation of gas and power has grown vastly more complex and tangled. Some basic changes in its make-up, powers, duties are inevitable. The result is likely to be simply attempts to unsnarl and speed up the FPC regulatory process. This is the first of a three-part study of the history of the agency, its present position, and its probable future to help readers better understand events of the next year or two as they unfold.

By NEIL REGEIMBAL

GAS Washington Bureau

The beginning

THE Federal Power Commission was born 41 years ago this summer, with little in its infancy to indicate the deformed monster it would become in adulthood.

Time and circumstances have left scars and malignancies which government doctors now are attempting to diagnose. The cures will be difficult, slow, and perhaps painful.

The commission in over two decades has grown from an agency with only 31 employees and a budget of $288,000 to one with 800 employees and appropriations of $7 million a year. Along the way, it has been granted a long list of powers and had a long list of duties imposed upon it.

Today, the commission regulates the interstate operations of the Nation's first (electric power) and fifth (natural gas) industries, with combined assets in the neighborhood of $70 billion.

To understand what the FPC is today, it is necessary to understand how it started, and even more important, how it has grown by a series of ill fitting additions of tasks, duties, and powers.

The FPC's birth was a minor event by any standards. It was formed by Congress in 1920 under the Federal Water Power Act simply to issue and administer licenses for hydroelectric projects. It was created to consolidate powers then separated among the Departments of Interior, Agriculture, and War. It consisted only of the three secretaries of these Departments, an executive secretary, an engineer officer and a staff on loan from the other government departments.

It was eight years later before the commission was allowed to hire its own staff.

The new five-man commission was less than two years old when it began asking for the power to control interstate commerce in electric power. This stemmed from a U. S. Supreme Court decision removing interstate wholesale rate regulation from state jurisdiction. As a first step, the FPC opened a study of electric utilities, particularly their financial situations. A year later it assumed jurisdiction over securities of licensed power companies unless they were under state securities control.

In 1933, the big buildup in the agency got up a full head of steam. It opened a massive survey of the nation's water resources, and then was ordered to help develop a "comprehensive" water power and power transmission public works program. The buildup was mainly in research and statistical fields, but was in-

creased further in 1934 when Congress asked it to compile a study of power rates.

By the end of 1935, the agency had added 260 employees over the five years, and had a staff of 290 and a budget of $1.4 million.

At this time, the FPC was also making monthly reports to Congress on natural gas utilities as well as power utilities. This helped form the basis for the Federal Power Act of 1935. This act gave the FPC power to regulate interstate transmission and sale of power at wholesale and also the companies engaged in these activities—the FPC's first true control of private firms not using federal water resources.

The original utility act had proposed to give the FPC power to regulate interstate commerce in natural gas as well as power, but it was eliminated before final enactment.

During 1936 and 1937, the commission worked doggedly to tighten the clamp of public control over private power firms. Uniform systems of accounts, annual reports, and regulation of interlocking directorates, mergers, securities, and property transactions were all instituted. FPC employment jumped to almost 400 and its budget to $1.7 million.

In 1937, Congress added another function to the commission when it made it responsible for allocating costs of the Bonneville Power Project, and approving rates for the sale of its power. Later, similar responsibilities for other public power projects were added. It was also made a major partner in the government's flood control planning, further increasing its duties.

By this time, the New Deal was in full sway and the regulatory fever was running rampant. Agitation for the government to control the baby of the utilities industry, the relatively new natural gas industry, had been underway for many years. It had become particularly strong after almost being included in the utility act along with interstate power sales.

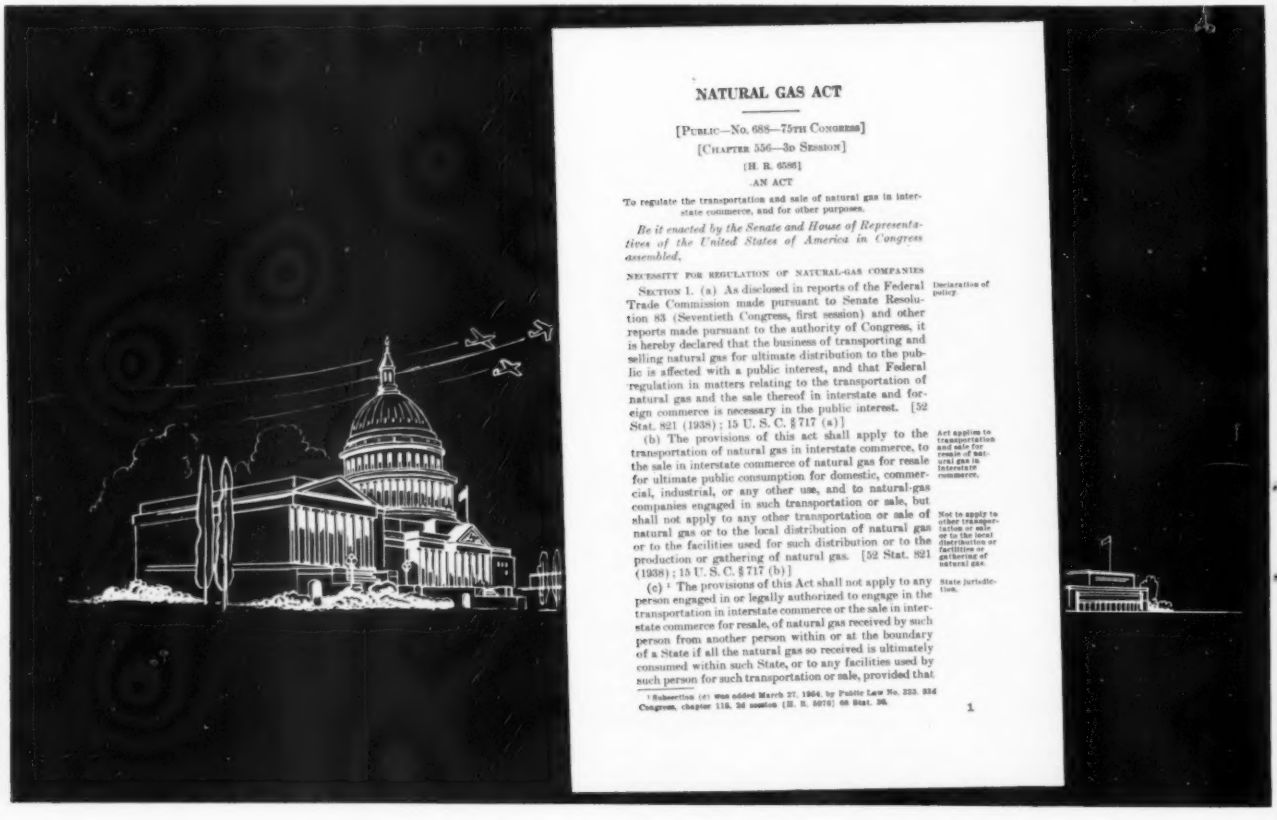
Proponents put on a determined drive in 1937 and 1938, and succeeded in passing the Natural Gas Act in 1938. The gas industry was put under the public thumb, where it is likely to stay.

The 1938 Act, however, gave the FPC power to regulate transportation of natural gas in interstate commerce, the sale in interstate commerce of gas for resale for ultimate public consumption, and the companies engaged in transportation and sale. Producers were exempt. So were projects to serve new areas.

From then on, the agency's growth and ever-spreading regulatory power follows the pattern of all government activities.

In 1939, it added 136 new employees, received a $2.2 million budget, and began seriously to regulate the relatively few pipelines which came under its jurisdiction with the first rate proceedings and the first uniform system of accounts for gas firms. It moved a little further in gas regulation when the President delegated his authority to it to receive applications for export or import of gas or power and recommend action to the White House.

With the U. S. entry into the war less than three



NATURAL GAS ACT

[PUBLIC—No. 688—75TH CONGRESS]
[CHAPTER 556—3D SESSION]
[H. R. 6586]
AN ACT

To regulate the transportation and sale of natural gas in interstate commerce, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

NECESSITY FOR REGULATION OF NATURAL-GAS COMPANIES

Declaration of policy.

SECTION 1. (a) As disclosed in reports of the Federal Trade Commission made pursuant to Senate Resolution 83 (Seventieth Congress, first session) and other reports made pursuant to the authority of Congress, it is hereby declared that the business of transporting and selling natural gas for ultimate distribution to the public is affected with a public interest, and that Federal regulation in matters relating to the transportation of natural gas and the sale thereof in interstate and foreign commerce is necessary in the public interest. [52 Stat. 821 (1938); 15 U. S. C. § 717 (a)]

Act applies to transportation and sale for resale of natural gas in interstate commerce.

(b) The provisions of this act shall apply to the transportation of natural gas in interstate commerce, to the sale in interstate commerce of natural gas for resale for ultimate public consumption for domestic, commercial, industrial, or any other use, and to natural-gas companies engaged in such transportation or sale, but shall not apply to any other transportation or sale of natural gas or to the local distribution of natural gas or to the facilities used for such distribution or to the production or gathering of natural gas. [52 Stat. 821 (1938); 15 U. S. C. § 717 (b)]

Not to apply to other transportation or sale or to the local distribution or facilities or gathering of natural gas.

State jurisdiction.

(c) [1] The provisions of this Act shall not apply to any person engaged in or legally authorized to engage in the transportation in interstate commerce or the sale in interstate commerce for resale, of natural gas received by such person from another person within or at the boundary of a State if all the natural gas so received is ultimately consumed within such State, or to any facilities used by such person for such transportation or sale, provided that

[1] Subsection (c) was added March 27, 1954, by Public Law No. 233, 83d Congress, chapter 115, 2d session [H. R. 5970] 68 Stat. 36.

1

months earlier, Congress in February 1942 amended the Natural Gas Act to require the FPC to certificate interstate gas transmission lines without regard to whether or not the areas involved were already receiving gas. This gave the government complete control of interstate gas pipelines. Only producers and intrastate operations remained uncontrolled.

Even before the end of the war, the FPC began laying the groundwork for what a decade later became the third major step in FPC gas control. In 1944, the commission opened an investigation of the entire natural gas industry, including "the extent and probable life of the nation's natural gas reserves; the present and probable future utilization of natural gas for domestic, commercial, and industrial purposes; the extent, character, and results of competition of natural gas with other fuels, and such matters as would be helpful to the commission in its administration of the Natural Gas Act or in determining what additional legislation, if any, should be recommended to the Congress."

As this study progressed, pressure from gas consuming areas—municipalities and distributors—for federal control of producers mounted. Finally, as the natural gas study was wound up in 1948, the commission on its own motion began an investigation of the gas rates of Phillips Petroleum Co. and whether, under Section 1B of the Natural Gas Act, the commission was required to take jurisdiction over producer prices as "gas sold in interstate commerce." At the same time, it opened an investigation of the original cost statements filed by gas firms.

After almost three years of hearings and study, the FPC ruled that it did not have jurisdiction over independent gas producers.

Three years later, on June 7, 1954, the U. S. Supreme Court ruled that the FPC was indeed required to regulate all gas in interstate commerce, including producers selling gas in interstate commerce for resale. It defined producers as "natural gas companies" under the original act.

This was equivalent, as the commission notes, to Congress adding a major new function to the commission, particularly since the Court did not spell out any specific method of regulation. In effect, the Court gave the commission a job it didn't believe it had, most members didn't believe they should try, and gave it no tools to carry it out.

In the seven years since the landmark Phillips decision, the commission has understandably wandered this way and that in attempting to solve the dilemma the decision created. While digging back into the Phillips case as ordered, the FPC did set, by a confusing case-by-case method, some precedent for the thousands of rate and certificate cases with which it was faced.

Costs were ordered to be considered "at least as a point of departure," in one court case, but the nature of the industry made this a nearly impossible yardstick.

Through much of the past seven years, the commission has obviously been conducting a holding action in gas regulation, hoping along with the producers and much of the rest of industry, that some type of bill would pass Congress to at least ease the regulatory burden if not remove it. One did, but was vetoed by former President Eisenhower. The veto came because of unsavory lobbying activities in spite of the former President's approval of its objectives. Two years later, a bill was making headway, but another minor political scandal killed it. Chances are that it will be many years before any bill passes, if one ever does.

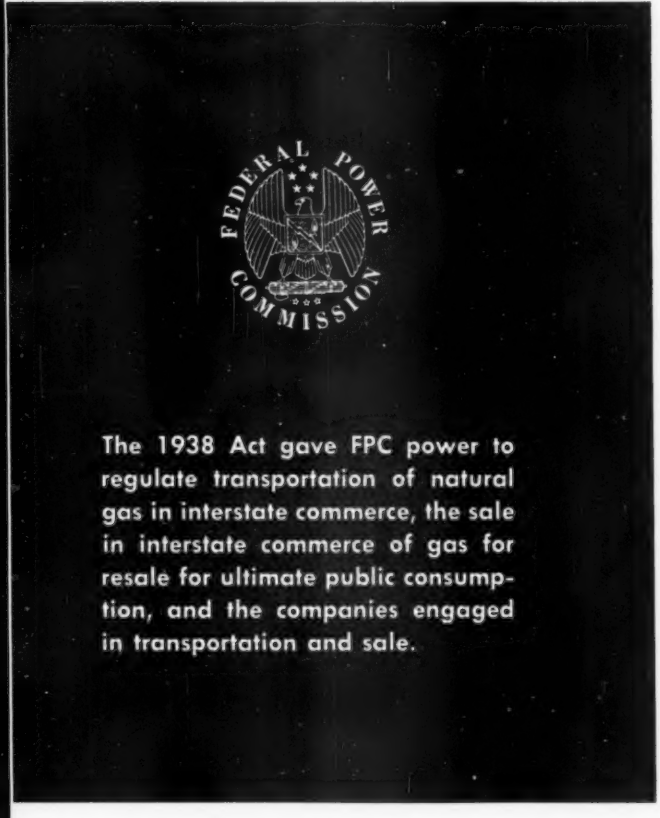
Last year, although still supporting legislation which would remove the utility pricing mandate from the courts, the FPC tried a new attack on the problem. In winding up its Phillips' investigation (after 12 years), the commission simultaneously issued a new area pricing formula. This set average maximum price levels in all producing areas for new and old contracts, and any price proposed higher than the maximum would have to be justified by full hearings under the normal unwieldy methods.

This policy, not particularly pleasing to the industry, is now being reviewed, criticized, and in general refined. It will probably be tested in the courts, too.

During the big years for the gas industry, particularly from 1942 through 1960, the FPC was also collecting new duties in the electric power field involving both federal and private projects.

Thus, the FPC enters what appears to be a new era —a time of more changes—with its largest staff (more than 800), its largest budget (more than $7 million), and a tremendous load. ■

(Next month: The FPC today)



The 1938 Act gave FPC power to regulate transportation of natural gas in interstate commerce, the sale in interstate commerce of gas for resale for ultimate public consumption, and the companies engaged in transportation and sale.

THIN WALL PIPE

A Survey of Trends in the Gas Industry

By
EUGENE H. WOOD
Chief Engineer,
Gas Division
City of Memphis

SINCE gas distribution engineers are responsible for keeping management advised of cost-cutting changes in construction or operation procedures, the engineering department of the Memphis Gas Division has been considering reducing construction costs through the use of lighter wall pipe in its distribution system.

Prior to the extensive use of coating and cathodic protection on underground steel pipe, a corrosion factor was designed into distribution facilities. This factor greatly increased the wall thicknesses above that actually required to safely withstand the operating pressures and to offer structural resistance to mechanical damage.

Memphis Gas has benefited by the use of a limited quantity of pipe lighter than standard pipe in the 8-in. size and larger. The approved use of this pipe was facilitated greatly by the publication, "Gas Transmission and Distribution Piping System (ASA B31.8-1958)."

More recently, we were discussing the feasibility of expanding the use of thin wall pipe. Discussions to determine the desirable extent of reduction in wall thickness were progressing, but the need for supplementary information was readily recognized.

It was decided that our final decision could best be made with a knowledge of the thin wall pipe experience of distribution companies around the nation. The results of any studies made by these companies would also be helpful.

Questionnaires were sent to 28 gas distribution companies, asking for present and contemplated practices in regard to pipe wall thicknesses. The questionnaire referred specifically to underground steel pipe where operating pressures did not exceed 100 psig and where coating and cathodic protection had been applied.

Companies were selected to get a good cross-section of the ever-expanding natural gas industry. Included are many of the larger and more progressive gas utilities in the U. S. Therefore, we believe any trends revealed by this survey to be reliable and representative of distribution companies throughout the nation.

The questionnaire did not ask for permission to identify the individual company with the details furnished. Therefore, in the tabulations, each company is indicated by a code letter (which remains the same throughout the report). The results of the survey have been tabulated and are shown in the accompanying tables.

Twelve of the companies supplied comments along with the questionnaire. The comments follow:

A distribution company in Iowa (Company D):

"While we have not given any serious consideration to thin wall pipe in the very small diameters, we have installed a substantial amount of the 0.219-in. wall in the 6-in. and larger sizes. This is an area that appears to offer possibilities for some reasonable savings . . ."

A distribution company in Ohio (Company F):

"In certain sizes, namely 8-in. and 10-in. the 0.219 wall is too difficult to line up and secure a satisfactory weld job. We have been using this thinner wall pipe since shortly after the ASA B31 Code became available. With our change to this thin wall pipe, we began applying coating and wrapping to distribution pipe. Our experience to date has been satisfactory. Our only difficulty has been that electric welding of 2- and 3-in. pipe with a thinner wall has been difficult to the point where we now make it a practice to acetylene weld these two sizes."

A distribution company in Illinois (Company H):

"We tend towards the use of thinner wall pipe in the interests of economy. So far, our only limitation has been possible damage during construction. We feel that, with our coating and cathodic protection methods, thin wall pipe, once in the ground, will be entirely satisfactory."

A distribution company in Michigan (Company J):

"We commenced using light wall pipe in 1950. However, its usage was dependent primarily on its availability. At that time, we specified light wall pipe for all mains to be coated and wrapped and heavy wall for all bare installations. At the present time, we are wrapping all pipe. As a result, light wall pipe has been standardized for all installations."

A distribution company in Louisiana (Company Q):

"We use 10-lb, 4-in. pipe, which is an unusual size. We use this particular pipe because of difficulty in making stoppers hold when we use a lighter weight and greater internal diameter of 4-in. pipe."

A distribution company in Alabama (Company S):

"We are at present conducting a study of the possible use of very light wall pipe in some new construction. The proven efficiency of various methods of protecting against corrosion appear to have eliminated the need for the so-called 'corrosion allowance' in the pipe wall."

A distribution company in Texas (Company T):

"Our company has been using pipe to the specifications as indicated for the past two years and our experience has been very satisfactory."

A distribution company in Texas (Company X):

"We are contemplating going to thin wall pipe, but our studies so far have not developed the information necessary to indicate the thickness we will use on the various sizes. One of our divisions has been approaching it from the angle of what thickness our least qualified welders could weld on taps—without burning through. But, inasmuch as they are now successfully welding 2-in. pipe with a thickness of 0.154 in., the thickness from that standpoint already seems fixed."

A distribution company in Georgia (Company Y):

"We adopted these weights several years ago, and at this time have no plans for lighter pipe. You will note that they are thinner in certain sizes than those generally used by the industry several years ago."

A distribution company in California (Company Z):

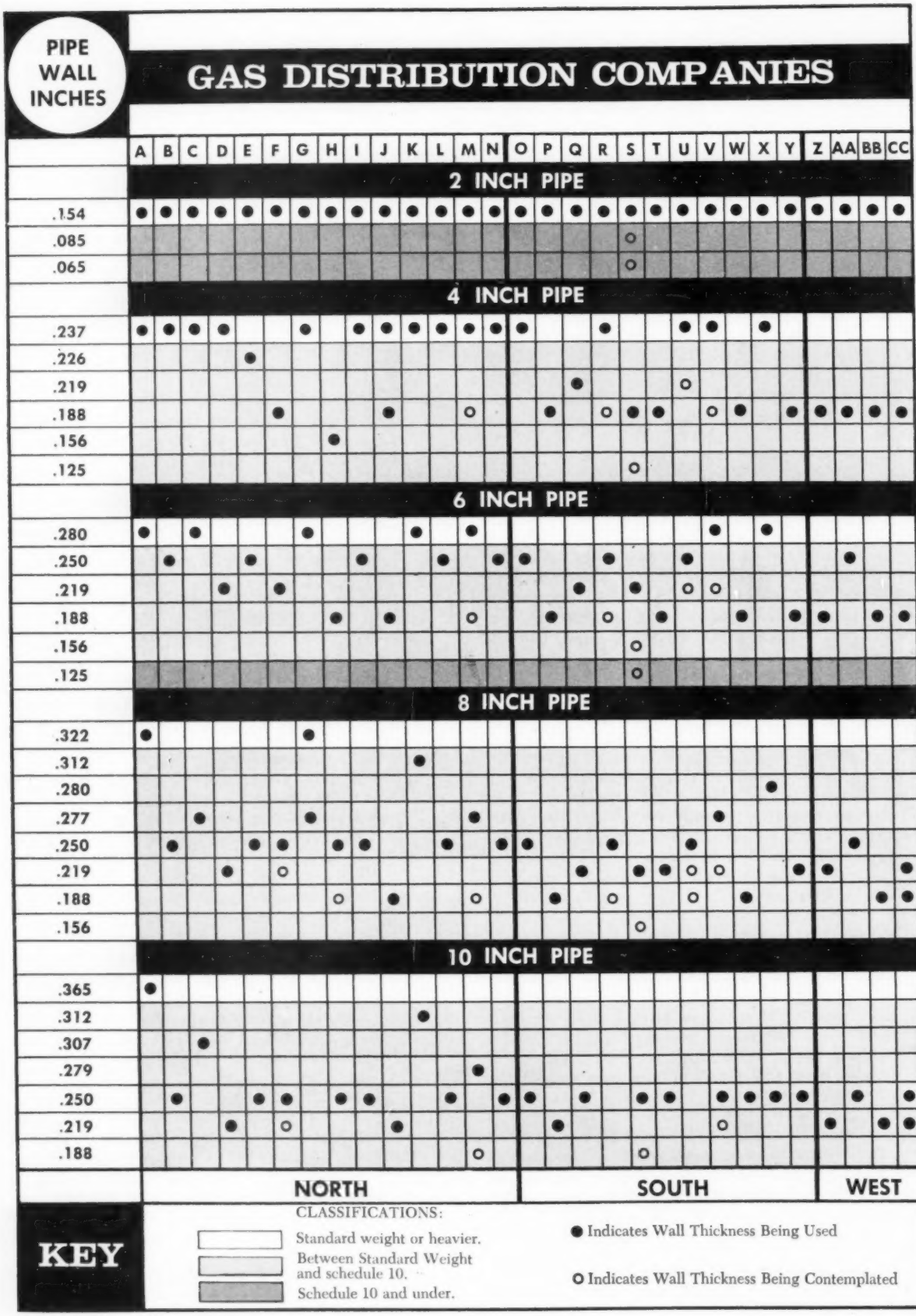
"We install the listed pipe throughout our gas system at pressures ranging from 10-in. wc up to the pipe design pressures allowed by the code. This pipe is installed bare, wrapped, or wrapped with cathodic protection, depending upon the soil type and the operating pressure. We do not normally adjust pipe wall thickness to the type of pipe protection that is to be applied."

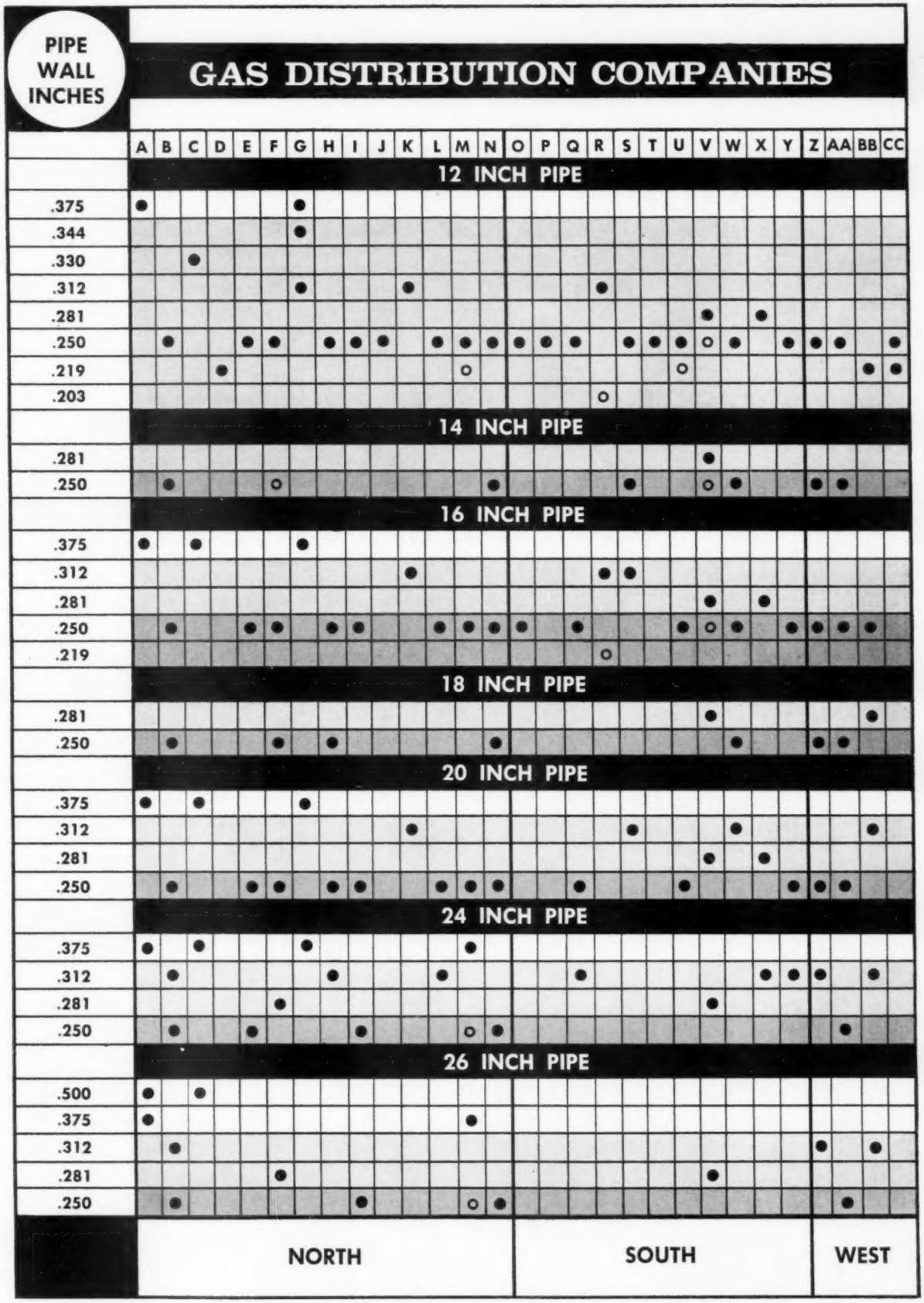
A distribution company in Colorado (Company AA):

"We are considering reducing the wall thickness at sometime in the future. While we intend to eventually standardize on thinner wall steel pipe than listed on the questionnaire, we have not yet concluded a detailed study of the question and are not able to state at this time what the final thickness specifications will be."

A distribution company in California (Company BB):

"We are using lighter than ASA standard weight


PIPE WALL INCHES
GAS DISTRIBUTION COMPANIES
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z AA BB CC
2 INCH PIPE
.154
.085
.065
4 INCH PIPE
.237
.226
.219
.188
.156
.125
6 INCH PIPE
.280
.250
.219
.188
.156
.125
8 INCH PIPE
.322
.312
.280
.277
.250
.219
.188
.156
10 INCH PIPE
.365
.312
.307
.279
.250
.219
.188
NORTH
SOUTH
WEST
KEY
CLASSIFICATIONS:
Standard weight or heavier.
Between Standard Weight and schedule 10.
Schedule 10 and under.
● Indicates Wall Thickness Being Used
O Indicates Wall Thickness Being Contemplated


PIPE WALL INCHES
GAS DISTRIBUTION COMPANIES
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z AA BB CC
12 INCH PIPE
.375
.344
.330
.312
.281
.250
.219
.203
14 INCH PIPE
.281
.250
16 INCH PIPE
.375
.312
.281
.250
.219
18 INCH PIPE
.281
.250
20 INCH PIPE
.375
.312
.281
.250
24 INCH PIPE
.375
.312
.281
.250
26 INCH PIPE
.500
.375
.312
.281
.250
NORTH
SOUTH
WEST

29 companies took part

ALABAMA GAS CORP.

ARIZONA PUBLIC SERVICE CO.

ATLANTA GAS LIGHT CO.

BALTIMORE GAS AND ELECTRIC CO.

BOSTON GAS COMPANY

BROOKLYN UNION GAS CO., THE

CITIZENS GAS AND COKE UTILITY

CINCINNATI GAS AND ELECTRIC CO., THE

CONSOLIDATED EDISON CO. OF NEW YORK, INC.

CONSUMERS POWER CO.

GAS SERVICE CO., THE

HOUSTON NATURAL GAS CORP.

IOWA-ILLINOIS GAS AND ELECTRIC CO.

LACLEDE GAS CO.

LONE STAR GAS CO.

LOUISVILLE GAS AND ELECTRIC CO.

MEMPHIS LIGHT, GAS AND WATER DIV.

MICHIGAN CONSOLIDATED GAS CO.

MINNEAPOLIS GAS CO.

MISSISSIPPI VALLEY GAS CO.

NEW ORLEANS PUBLIC SERVICE INC.

NORTHERN ILLINOIS GAS CO.

OHIO FUEL GAS CO., THE

PACIFIC GAS AND ELECTRIC CO.

PUBLIC SERVICE CO. OF COLORADO

SOUTH CAROLINA ELECTRIC AND GAS CO.

SOUTHERN CALIFORNIA GAS CO.

UNITED GAS CORP.

WASHINGTON GAS LIGHT CO.

pipe wall thickness for distribution. Such pipe is used for mains operating at pressures less than 100 psig and, in some instances, for mains operating at higher pressures. It is our conviction, after many years of such operation, that the thin wall pipe has sufficient structural strength, particularly in the smaller sizes. This experience is based upon all buried pipe having an external coating, with cathodic protection being applied only to 'hot spot' areas where corrosion subsequently occurs. While we endorse the ASA minimum wall thickness, we make no reduction in our pipe wall thicknesses simply because of corrosion protection measures. In fact, as the pipe diameters increase, we generally use thicknesses greater than the ASA minimum because, in our opinion, there is need for increased structural resistance to mechanical damage."

This survey readily indicates a definite trend towards the use of thinner wall pipe where external corrosion has been successfully mitigated. It also indicates that most of the companies are interested, and that serious studies are being conducted with the thought of substantial savings.

Referring again to the tabulations, simple calculations of average percentages (excluding the 2-in. size) indicate that 18 per cent of the companies are presently using pipe of standard weight or heavier, 61 per cent are using pipe between standard weight and Schedule 10, and 21 per cent are using pipe in Schedule 10 and under. This last classification may be considered in the thin wall category. If the contemplated thicknesses were used, these percentages would, of course, change—with an increase in the percentage of companies using thin wall pipe.

It is interesting to note that the tabulations in this survey show that 0.250-in. wall is the most popular thin wall thickness in the 14- through 26-in. sizes being installed at the present time. This thickness also predominates in the 6- through 12-in. sizes. Also, the survey shows that the gas companies in the North are using heavier pipe than those in the South and West. It is presumed that this is due in part to the colder climates and deeper frost lines.

The survey also indicates that—in general—the industry is being very cautious in its acceptance of the *very* thin wall pipe. However, as can be seen, there is a trend in this direction which will very likely continue until the industry feels that the safe minimum has been reached. Perhaps this minimum will be in the *very* thin wall category, depending upon sufficient experience—which, we believe, is lacking at present.

In conclusion, this survey has provided information that has confirmed our thinking that we can, safely and without fear of false economy, reduce the wall thickness of gas mains adequately protected against corrosion.

Based upon the Memphis Division's consumption of pipe for the year 1959, our presently proposed slight reduction in wall thickness (see the code letter V) would have reduced the amount of steel purchased for our municipal system by 225 tons or 12.35 per cent, a really significant saving. ■

PERIODIC METER CHANGING

SOUTHERN COUNTIES

ADVANCE SCHEDULING GETS THE WORK DONE

The final installment in a three-part series by Albert D. Petersen, customer service manager at Southern Counties Gas Co. The changing pattern of PMC work, revealed in the two previous articles, necessitated a reappraisal of PMC planning, scheduling, and dispatching. The net result: reduced costs during a period of rising costs.

IN the days when the volume of periodic meter changes was small, it was a relatively simple task to meet annual quotas by doing the job as fill-in work. This was accomplished primarily by issuing PMC orders to men on regular routes to fill out a day's workload. Occasionally—when the workload was particularly light—a full day of changing meters would be assigned. In this manner, the annual quota was gradually whittled down. If—toward the end of the year—a sizable number remained, they were cleaned up by working on Saturday.

Following World War II, the volume of PMC's, as well as other types of work, increased at an accelerated rate. It became clear that the "fill-in" approach with old age changes was not adequate. It became harder and harder to meet annual quotas without resorting to year-end crash programs. Obviously, something had to be done.

A thorough study of the problem was made. Particular emphasis was given to (1) improving PMC planning and scheduling and (2) developing standards of production.

To accomplish the first objective, an analysis was made for each of our eight operating divisions—to determine the workload and manpower availability for each month of the year.

This analysis indicated that the best time for doing non-request types of work was during March, April, May, and June. Prior to this, it was generally believed that summer was the best time for such work because service request orders were at their lowest. However, the analysis of workloads and manpower availability showed that vacations were a big offsetting factor during this time of the year. Actual manpower available during the summer months was not much greater than during the fall and winter peaks.

A review of past PMC planning and scheduling revealed a somewhat similar pattern, year after year. At the beginning of the year, when PMC orders were issued by the meter shop, the divisions were still in the winter peak load season. There wasn't time to do other than request-type orders, so the PMC's were put off for a later time. Since the peak load season usually continues through February and sometimes into March, very few changes were made during the first quarter. When the heavy load let up, it was usually followed by a period of catching up with other jobs and a natural "letdown" in order production. As indicated by the workload-manpower analysis, this is the period when PMC's should have been scheduled, but—as a rule—were not. As a result, the number of changes during the second quarter showed very little increase over the first. However, since summer was

DIVISION MANAGER CALCULATES ANNUAL WORK LOAD ON THIS FORM, THEN

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CUSTOMER SERVICE WORKLOAD CALCULATION SHEET, 19___

DIVISION

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ESTIMATING BASIS USED
ACTIVE METERS													
MONTHLY INCREASE													
ORDERS PER 1000 METERS													
CSOs													
ONs													
OFFs													
SIM Ns & Fs													
METER SETS													
ROUTINE METER CHANGES													
REMOVES													
NON-PAYS - OFF/PAID													
NON-PAYS - EXTD.													
NON-PAYS - TURNED ON													
PARTS													
REREAD & VERIFY													
PMOs													
MAN DAYS													YEAR
CSOs													
ONs													
OFFs													
SIM Ns & Fs													
METER SETS													
ROUTINE METER CHANGES													
REMOVES													
NON-PAYS - OFF/PAID													
NON-PAYS - EXTD.													
NON-PAYS - TURNED ON													
PARTS													
REREAD & VERIFY													
PMOs													
GAS ENGINES													
AIR CONDITIONERS													
CNCs													
SUBTOTALS													
PMCs													
VOL. INSP. - SCHOOLS													
VOL. INSP. - RESTAURANTS													
VOL. INSP. - MOTELS													
TOTALS													

SUMMARIZES THE RESULTS IN A MANPOWER ESTIMATE ON THIS FORM.

❷

CUSTOMER SERVICE WORKLOAD-MANPOWER ESTIMATE, 19___

DIVISION

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
WORK DAYS													
ORDER VOLUMES													
CSOs													
ONs													
OFFs													
SIM Ns & Fs													
METER SETS													
ROUTINE METER CHANGES													
REMOVES													
NON-PAYS - OFF/PAID													
NON-PAYS - EXTD.													
NON-PAYS - TURNED ON													
PARTS													
REREAD & VERIFY													
PMOs													
GAS ENGINES													
AIR CONDITIONERS													
CNCs													
EMCs													
VOL. INSP. - SCHOOLS													
VOL. INSP. - RESTAURANTS													
VOL. INSP. - MOTELS													
MAN DAYS REQUIRED FOR													
ORDER VOLUMES													
SICKNESS & PERS. EMERG.													
LABOR TRANSFERS													
VACATIONS & MIL. LEAVE													
REPLACEMENT TRAINING													
DIVISION TNG. MEETINGS													
EMPLOYEE ACTIVITIES													
WORK ORDERS													
TOTALS													

HE BALANCES THE TOTALS WITH PMC WORK, AS SHOWN.

MANPOWER SUMMARY (BASED ON A CURRENT STAFF OF 58 MEN)

TOTAL MANDAYS REQUIRED	1147	1047	1145	1008	1102	1134	1136	1297	1192	1234	1240	1170
MANDAYS AVAILABLE	1176	1064	1288	1120	1232	1232	1120	1288	1160	1276	1218	1160
MANDAYS OVER/SHORT	+ 29	+ 17	+ 143	+ 112	+ 130	+ 98	- 16	- 9	- 32	- 18	- 22	- 10
OLD AGE METER CHGS	- 29	- 17	- 135	- 120	- 125	- 98	- 20	- 25	- 10	- 8	- 5	- 8
TOTAL MEN OVER/SHORT	0.0	0.0	+ 0.3	- 0.4	+ 0.2	0.0	- 1.8	- 1.5	- 2.0	- 1.2	- 1.3	- 1.0

AVERAGE MEN OVER/SHORT [ ] [ ] [ ] [ ] [ ]

DATE PREPARED_____

still ahead, there was always the hope that the quota could be made up during that period. This proved to be a false hope because—as the workload-manpower analysis showed—vacations threw a "monkey wrench" into these plans. This left only the last quarter of the year with its heavy load of "light pilot" and service request orders.

Consequently, the only way left to complete the PMC work was Saturday overtime. This was not only costly but unnecessary—if the plan of scheduling this type of work during low workloads periods was strictly followed. Such planning and scheduling has been followed in our company now for several years and has eliminated the problem of PMC's building up at the end of the year.

Each division prepares its own Customer Service Workload-Manpower Estimate *(Fig. 2)* prior to the start of each year. On the basis of this information, monthly PMC quotas are established. *Fig. 2* shows the typical division workload projection and how the PMC's are distributed during the year, in relation to the available manpower. The forms used for these calculations, including the Customer Service Workload Calculation Sheet *(Fig. 1)* are being improved.

The scheduling system we now follow had its beginning about 1951 when individual job standards were set up. By 1954, these standards allowed us to systematically plan customer service work. Then, during 1955-'56-'57, cost control accounting was applied to all items.

With the information thus gained, we were able—in 1956—to compile our first month-by-month PMC schedule for each division and for the company. *Fig. 3*, an example of the schedule for all eight operating divisions, illustrates the peak change period during the spring months, as compared to the remainder of the year.

The objective of our planning program is to estimate—with a reasonable degree of accuracy—future workload and manpower requirements. Such estimates enable us to anticipate training requirements and equipment needs and to effectively schedule PMC quotas, voluntary inspection programs, vacation schedules, and other variables of customer service work. Briefly stated, the estimating procedure is to calculate—on the basis of past experience—the workload volumes that can be expected to accompany new meter growth levels; then to determine the man days needed to meet estimated workloads and the man days available from present personnel.

A number of years of systematic record keeping have preceded—and made possible—the present system of estimating. The customer service supervisor in each division has figures showing the average time spent by the field men in his division on each type of customer service work. Using the number of workdays in the month and an estimate of the meters which will be active in the division for the month, the customer service supervisor is able to draw an accurate picture of his workload and manpower requirements. He first estimates the amount of non-controllable work, month-by-month, for the coming year. Then he fills in such things as periodic meter changes, vacations, and voluntary inspections to arrive at a fairly level workload, as close as possible to the total available manpower *(Fig. 2)*. The estimate shows when to add manpower most economically and efficiently and when to schedule PMC's so they will be completed during the year.

Information SoCounties uses to make these estimates comes from various sources. Our sales department regularly provides predictions of expected meter growth each year. This has averaged between 40,000 and 50,000 meters for each year. Our customer service staff provides each division with a calculation of the average time a field man in that division will spend on each call for each type of order, using a three-year average to avoid misleading fluctuations. The personnel department supplies information on sick leave, personal time off, vacation and military leave, and employee activities. The meter shop provides information on the number of meters which must be scheduled for periodic changes, and also on the month-by-month capacity of the shop to inspect and rework meters.

Basically, what the supervisor does is to set down all the customer request orders he expects in his division during the coming year. He adds to this the time to be spent by customer service personnel on all other items. Then, after leveling out the work month-by-month, he checks to see if he is going to need any extra men to do the job.

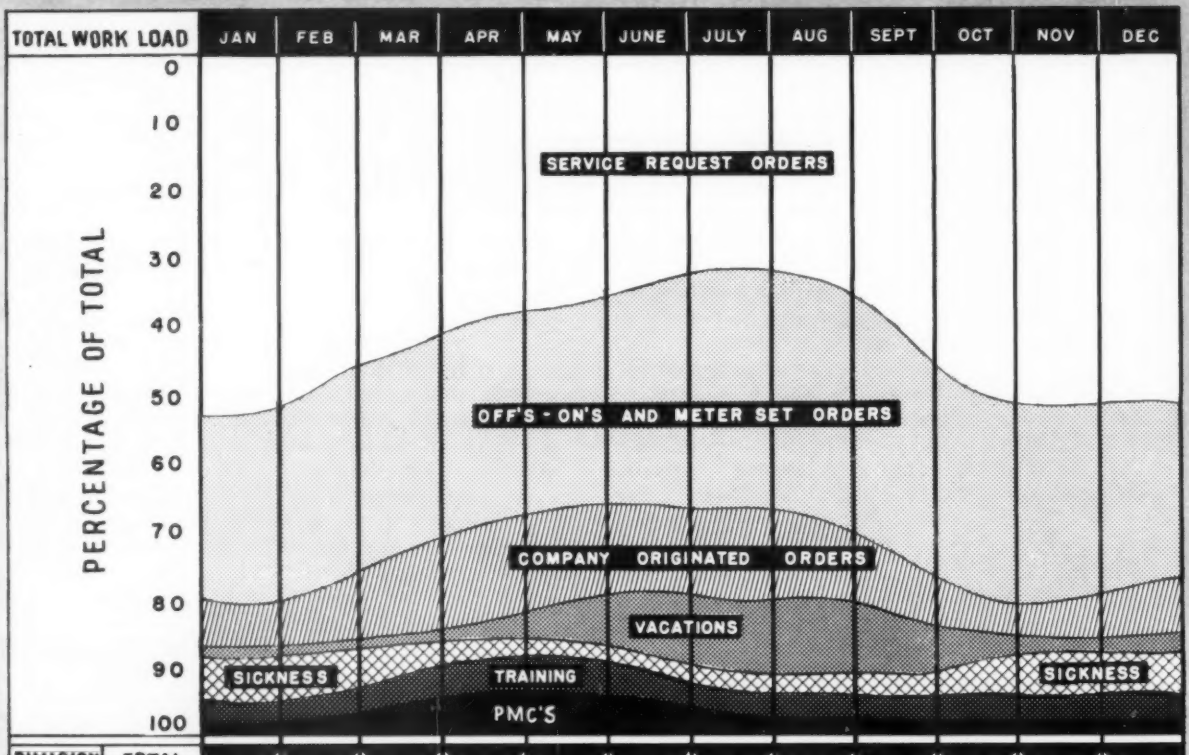
More specifically stated, in order to complete a Customer Service Workload Calculation Sheet *(Fig. 1)*, the supervisor first fills in the number of work days in each month. He then fills in the total number of meters expected to be active in the division each month and calculates, from these two figures and from past experience, the number of each type of customer order expected to be performed each month.

These customer order volumes are separated into such categories as: customer service orders (normally requests for appliance service), ons, offs, simultaneous ons and offs, meter sets, routine meter changes, meter removals, non-pays, parts replacement, re-read and verify, miscellaneous work orders, gas engines, air conditioners, and could-not-completes. After making these calculations, the supervisor translates his figures—with the help of charts made up by the customer service staff—into the total man days required for this work each month.

To this, he adds the man days required for sickness and personal emergency, labor transfers, vacations and military leaves, replacement training, and division meetings. The result is the total man days required for non-controllable items for each of the coming 12 months. Matching this total against the man days available (work force multiplied by the number of work days in the month) gives the time left for controllable items, such as vacations, periodic meter changes and voluntary inspections of schools, restaurants, and motels.

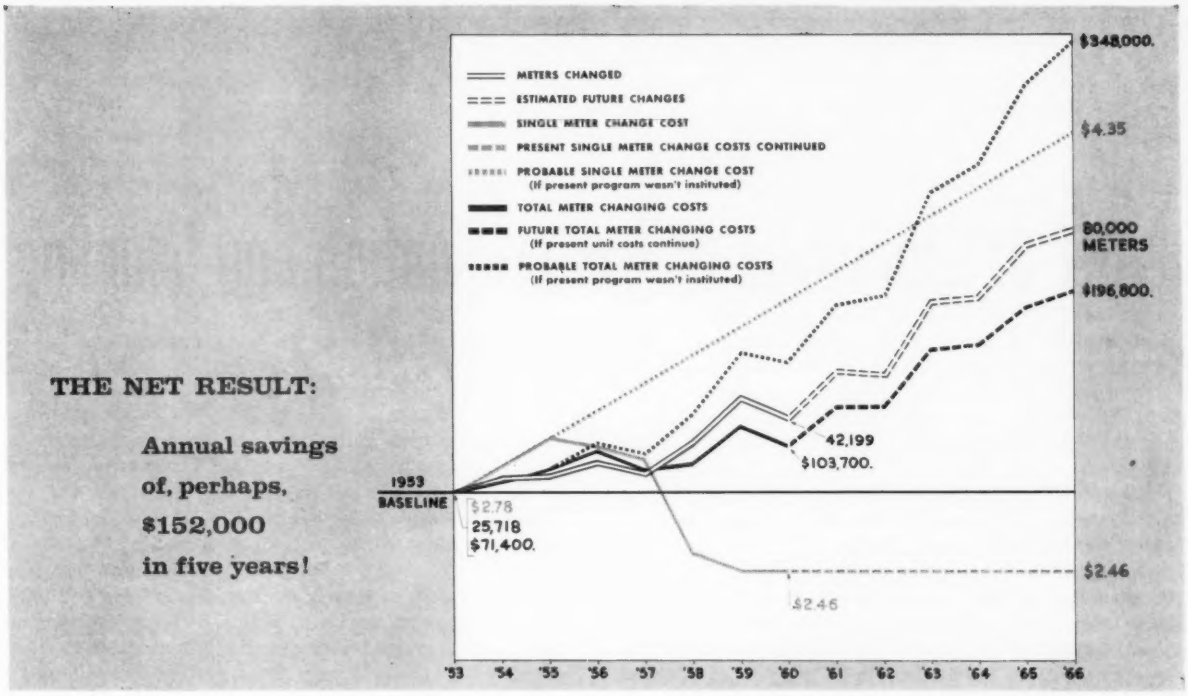
Shifting the controllable items helps the supervisor schedule the yearly work load efficiently. Sometimes, he finds that his "Total Men" figure consistently runs on the minus side. This is a good indication that his staff will have to be increased. Besides being an excellent yardstick on the necessary size of staff, the Workload-Manpower Estimate also provides check points through the year for work progress. For ex-

STATISTICS SHOWED THE "SUMMER" SLUMP REALLY CAME IN SPRING; SO



DIVISION	TOTAL	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
A	8931	854	500	2270	1553	1553	810	500	500	200	100	91	-
B	13347	1319	1108	1324	1723	1722	1375	920	920	788	748	560	840
C	7329	462	500	1238	1200	1200	1200	400	500	484	145	-	-
D	2882	305	260	215	300	300	300	300	300	160	160	160	122
E	10182	303	500	1697	900	1600	1400	500	1200	500	500	500	582
F	2614	140	200	296	350	350	200	150	150	150	250	250	128
G	3161	65	306	443	56	366	123	123	441	122	414	458	244
H	2583	354	250	300	250	250	225	125	125	125	200	200	179
SYSTEM	51029	3802	3624	7783	6332	7341	5633	3018	4136	2529	2517	2219	2095

PMC SCHEDULING MUST FOLLOW SUIT, AS SHOWN BY THIS 1961 SCHEDULE



THE NET RESULT:

Annual savings of, perhaps, $152,000 in five years!

ample, if a division for some reason is unable to meet its PMC schedule during the first three or four months of a year, the estimate can be used as a basis for rescheduling the work during the remaining months.

The second objective of our study of customer service work was to develop standards of production for PMC work so we could do a better job of dispatching on a day-to-day basis. Before our hot meter change device came into use, the time for changing a meter varied considerably This was—in part—due to the variations in turning off and relighting different appliances and in the number of appliances involved in each job. It was also due to the time spent on "not home" calls and to regarding PMC's as "fill-in" work rather than as a full-day's work.

Before the hot meter change device came into use, the average completion time for a PMC, including "not home" calls, was 47 minutes. This included the system average of 7 minutes per order for driving time. This meant that we could average only 10 changes per day. Experience showed that we usually obtained somewhere between 8 and 12. Now, the average completion time is 25 minutes and the daily average is 18 changes.

With the change in PMC planning and scheduling, it also became necessary to dispatch this work on a full-day-route basis rather than as fill-in work. With improved trucks, the hot change device, full route loading of change orders, and the knowledge that 18 PMC's per day was average, dispatch units did not hesitate to issue up to 25 orders per day. In "tracts" or where multiple headers were involved, this goal was often attained. In one division, a fieldman averaged 21 changes per day for a year. Once, two fieldmen in competition with each other completed 41 and 39 changes in a single day. In this case, there was no question but what conditions were ideal with less than normal driving time between orders. We don't expect this kind of production day after day, but such performance does illustrate the potential for changing meters with the hot change device.

With such improved efficiency, PMC costs would have a tendency to drop. However, sky-rocketing material costs and labor (up from $1.90 to $2.65 per hr during the last eight years) tend to push PMC costs right back up. Fortunately, our program has been effective enough to buck the rising price trend. Costs on a per-meter-change basis have dropped each year for the last five years. Last year, each PMC cost us $2.46, as opposed to a high of $3.03 in 1955. If PMC costs had stayed at that 1955 level, our 1960 expenditure for this work would have been $24,000 more than it was.

In the future, our PMC efficiency may be even further increased through improved techniques and equipment. Certainly, our periodic meter changing activity will increase at a tremendous rate, thanks to southern California's housing boom of the mid-50's. In another few years, all the meters installed in the mid-50's will be 10 years old and will have to be changed. Thus, five years from now, we will be changing 80,000 meters per year, 90 per cent more than we changed last year. With such a challenge ahead of us, we can only think about the future and how we can improve on the improvements related to you in this periodic meter changing series. ■

By Irving Deutsch

PART 3: Economics of gas production and handling

THE history of the gas industry was traced in the first article (May GAS). It was seen that the nature of the gas industry, like most utilities, was an almost consistent rise and fall of consumption on a daily, weekly, and yearly basis.

Last month, the properties of gas were discussed in order to develop a basis for understanding problems to be discussed in the following articles.

This month it is desired to establish fundamental economic factors that set up both the cost of gas and the rate that must be charged in order to insure an equitable return on investment. Here, too, it will be seen that the peak-valley nature of the gas load strongly affects the cost, rate structure, and technology, of gas. It is also desired to tie-in transition from the manufactured gas era to the present natural gas era.

There has been a discussion of the peak-valley problem in general romantic terms, but it is now necessary to be more specific and develop this trend on a quantitative basis over the years. *Fig. 1* shows a typical system sendout curve plotted on a monthly basis for the years from 1950. The ever-widening gap between valley and peak is clearly evident. It can also be noted that peaks seem to be growing with an increasing rate, but the valleys seem to grow at a constant rate, which of course will vary from system to system.

Fig. 2 shows a duration curve for one year. This is a curve made by taking the daily load in a given year and plotting, in consecutive order starting with the maximum day, the load versus days duration of the load. There will be few days that will have the same exact load; hence, the curve will have a constantly decreasing slope. Two plateaus are evident;

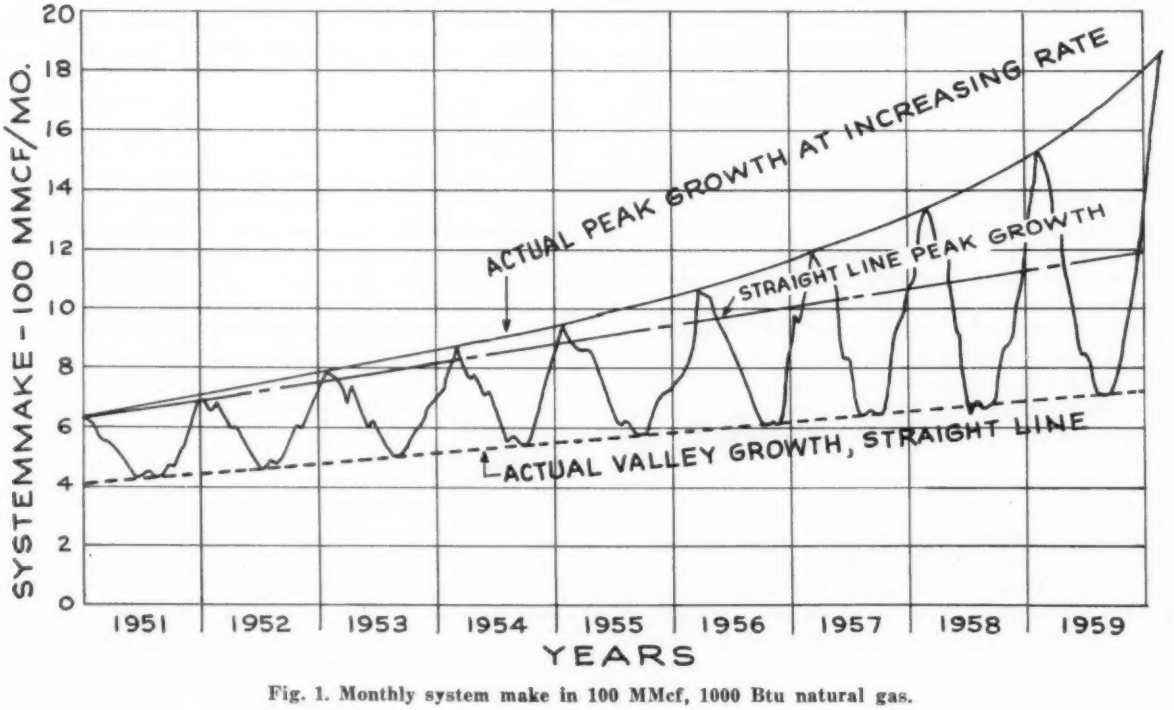


Fig. 1. Monthly system make in 100 MMcf, 1000 Btu natural gas.

namely, the summer and winter. *Fig. 2* is used essentially to show how the peaks are provided for and what is done with the excess valley gas. However, the duration curve can be used just as well to establish the sequence of starting up sets in a manufactured gas system.

With these pictures of peaks and valleys over the years, and during a particular year, we can now introduce cost components that must be considered to establish cost and equitable rates that will be fair to low and high consumption customers alike. In a general sense, it makes no difference if the customer we are talking about is a gas company buying gas from a pipeline company or a consumer buying gas from a distribution company. Following are the major cost components:

Production-demand costs:

Fixed charges: interest, depreciation, taxes, insurance, some maintenance and repair costs, and labor must be paid to insure plant capacity even though the plant were shut down or in the event of no production.

Distribution-demand costs:

Fixed charges: interest, depreciation, taxes, insurance on the distribution system investment, maintenance and repair costs incurred regardless of how much gas is distributed.

Customer costs:

Meter reading, keeping accounts, appliance service. These costs should have nothing to do with hourly demand. They are set by themselves because they are not commodity costs in a going concern, and they are not demand costs because they remain relatively constant regardless of demand.

Commodity costs:

These costs depend upon the actual amount of gas produced, such as labor, fuel, and materials used in production, and should discontinue when production is discontinued.

As the demand or peak increases over the average load, the unit (usually Mcf) cost goes up. Hence, if a plant capable of 100 units capacity per day only produces 50 units on the average, the demand cost must be taken up by the 50 units and unit demand cost will be twice that of peak capacity production. Another way of saying it is, the unit cost will be a minimum if the facilities are used at maximum capacity or unity load factor (the ratio of average to maximum demand in any given time period).

The demand costs due to peaking can be modified somewhat by storage facilities and the ability of a gas machine to run at severe over capacities for short duration runs. However, if the peaks become unusually severe, to the extent that available storage facilities are small compared to the peak, a point is reached where the demand charges of the facilities exceed their value. To a greater or lesser extent this point has been reached in many systems for conventional types of low pressure storage. Low pressure storage facilities have a use in production plants when the plant goes on the line and there is a chance that some gas will be made that is not up to standard. Storage facilities make it possible to mix substandard gas with large quantities of good gas. If facilities are truly peak-shaving facilities and not full load standby plants, this can be accomplished by starting with a

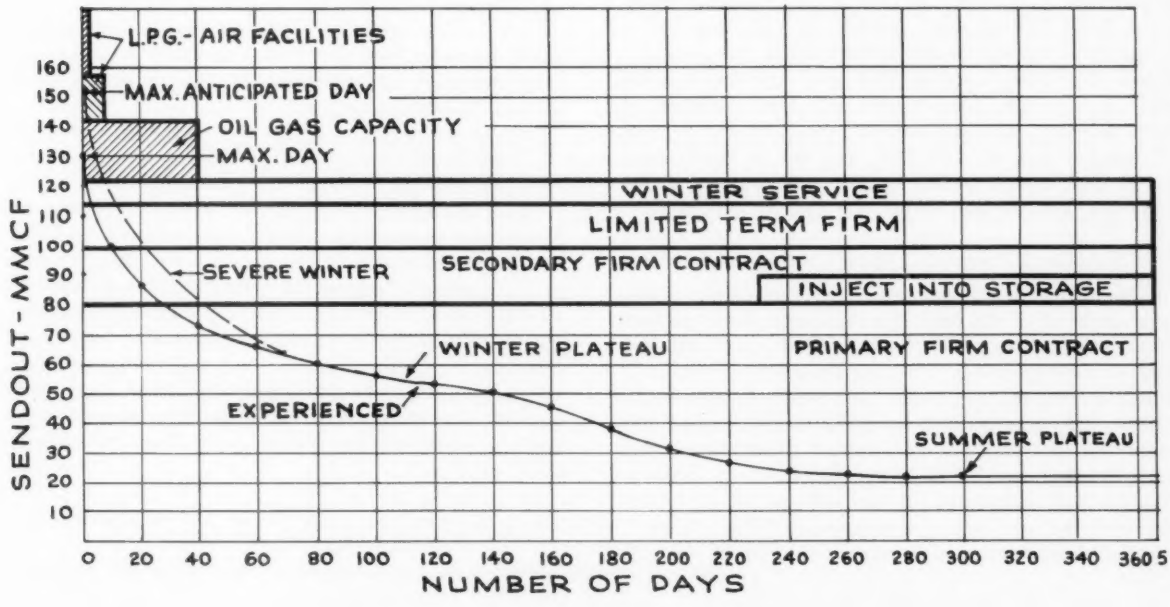


Fig. 2. Duration curve, firm gas sendout.

low make and mixing with large quantities of base load gas (gas normally supplied to the system). To gain the advantages of storage on an annual basis, both natural and man-made underground storage are being used; liquefaction of the base load gas or components thereof are being considered; and peak-shaving facilities designed to use easily stored oil and gasoline-type hydrocarbons as feedstock are being seriously investigated. This will be dealt with thoroughly in future articles.

In the latter part of the manufactured gas era, a system with 10 MMcf storage and a 20 MMcfd peak would only need production capacity for 10 MMcfd to meet the peak for a day. With over-capacity operation, a capacity peak could be met for several days. Beyond several days, drastic measures were often resorted to, such as shutting down customers. If the peak were to grow to 100 MMcfd, then the storage capacity of the system would drop to 10 per cent of the peak. Intuitively, it can be seen that demand charges would have been excessive if new facilities were necessary to meet the peak load, or if conventional storage facilities were increased with low pressure holders or high pressure Hortonspheres.

Distribution demand costs were also reaching a limit. For, to satisfy the increasing load without increasing the $H/\sqrt{SG}$ value of the gas meant that more or larger pipe would have to be installed and upgraded to operate at higher pressures.

The cost of coal, coke, oil, and labor were increasing to force commodity costs to as much as $1.50 per Mcf of 1000 Btu equivalent gas. There is no doubt that the gas industry was in the midst of a crisis, and there is even less doubt that God thinks kindly of the gasman and his industry for it was in this dark period, economically speaking, that natural gas became available in abundant supply at a price that was literally a fraction of the cost of producing water and coal gas. And, if that's not enough, natural gas had a $H/\sqrt{SG}$ of 1280 as compared to the $(50\ H/\sqrt{SG}$ value for water gas of 550 Btu per cu ft HV and .7 SG. The almost 100 per cent increase in Btu carrying capacity made possible by the coming of natural gas, put off the need for a tremendous investment in distribution system, and made it possible for manufactured gas systems to operate profitably.

COST AND COST STRUCTURE OF NATURAL GAS

The same basic economics are involved in determining the fair and equitable cost, and rate structure of natural gas—namely the consideration of demand and commodity costs. The fact that natural gas was supplied through a pipeline, and because the peak-valley ratio was getting larger and larger, and because low cost peak shaving or storage of natural gas is still being sought, it is necessary now to have a fundamental knowledge of how natural gas rates to the distribution companies are established. We will use the basic demand and commodity method of evaluation.

In order for pipeline people to operate efficiently, they must use facilities at peak capacity to keep unit demand cost low; hence, they insist that their customers, distribution companies, contract for a specific daily take on a year-round basis. The charge is broken into two portions—the demand charge and commodity charge. These make it possible for the distribution company to pay for facilities that are made available to it on a firm contract basis whether it takes the gas or not. Yet, the distribution company is not forced to pay for gas which it did not take and is still in the possession of the pipeline people. The arrangement works to the benefit of both parties, since the distribution company will find that its unit cost will be a minimum if it can take the full contract allotment; yet it is not unduly penalized for not taking the gas if it can't. On the other hand, the pipeline people would rather sell the gas to the contracting firm; yet if it does not sell it, the pipeline can make it available to other customers that may want it.

During the valley period of the year the distribution companies will try to sell their gas to interruptible customers. These are customers that receive gas at a special rate, but agree to relinquish gas service at the request of the gas company. Combination gas and electric companies use their own electric generating facilities as their interruptible customer, so to speak.

Of course, the real solution to this problem is to build up the valley load with regular customers by promoting development of a summer gas load that would include gas air conditioning, water heating, lighting, outdoor cooking appliances, and better industrial appliances for drying, heat treating, sterilizing, incineration, etc. The American Gas Association is devoted to this end.

The demand charge, though regulated by the Federal Power Commission, is based on total fixed cost of the pipeline company plus those costs that would be required if no gas were flowing through the pipeline at all. The rate is established as a fixed charge per Mcf of contract demand on a daily basis per month. Other methods of fixing the demand charge could be used, but the $/Mcf of daily contract demand/month is in common use. As an example, let us take the following case:

Firm contract demand = 50,000 Mcf/day (or Mcfd)
Demand charge = $3.50/Mcf of contract daily demand/month
Total demand cost = $3.50 x 50,000 = $175,000/month

The commodity charge is, as the name implies, the cost of the commodity. Again, this is fixed by FPC. Usually the commodity charge is leveled as a charge per Mcf ranging about 20 cents/Mcf to as high as 50 cents/Mcf, depending upon the distance from the source. The more compression necessary (a charge associated with the flow of the gas or, if you wish, a transmission cost) and the more pipe it must pass through, the more cost associated with transmission, also the more the commodity cost. To continue the above example:

Commodity charge = 40 cents/Mcf
In a 30-day month at a total contract take, the commodity cost = 40 cents/Mcf x 50,000 Mcfd x 30 = $600,000

To find the average cost per Mcf when the full contract Mcf per month is taken:

$$\text{Average cost per Mcf} = \frac{\text{Monthly demand plus commodity charge}}{\text{Total Mcf taken during the month}}$$

$$\text{Average cost per Mcf} = \frac{\$175{,}000 \text{ plus } \$600{,}000}{50{,}000 \text{ Mcf} \times 30} = \$.517/\text{Mcf}$$

Let's figure the average cost if only 90 per cent of the contract is taken in any given month; i.e., .9 x 50,000 = 45,000 Mcfd. The demand charge remains the same, only the commodity charges; hence:

$$\text{30-day commodity cost} = \$.50 \times 45{,}000 \times 30 = \$540{,}000$$

$$\text{The average cost per Mcf becomes} = \frac{\$175{,}000 + \$540{,}000}{45{,}000 \times 30}$$

$$\text{The average cost per Mcf becomes} = \$.53/\text{Mcf}$$

The $.013 difference doesn't seem to be much on an Mcf basis, but for the 45,000 taken it means an additional $585 per day, plus the loss in revenue for the 5000 Mcf not sold.

Now let's look at the other side of the story—what happens when more than the contracted amount is needed to meet a peak. Well, most contracts allow a 2 to 5 per cent over-run. Beyond the over-run there is a severe penalty over several dollars per Mcf to discourage over-running unless it is absolutely necessary. As shown in *Fig. 2*, a second firm contract may be available from another pipeline company at usually a higher price but in smaller amounts. This helps the peak problem but makes the valley problem all the worse. It sometimes pays to store gas, to be withdrawn during winter months, in an underground storage field not too far from the system in question. Winter service contracts are also available on a short term basis. They usually cost a great deal since the peak may not rise high enough or often enough to use the contract amount; hence, demand charges are paid on gas that is not used, or is sold on an interruptible basis at a loss.

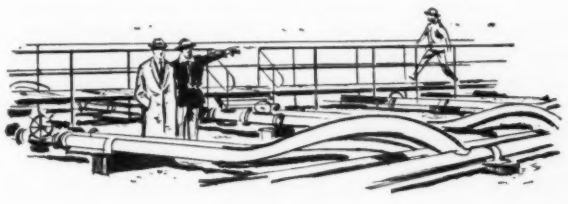
Beyond the winter service contracts it does not usually become economical to purchase gas. Most systems have manufacturing facilities that can be converted to manufacture a reasonably interchangeable high Btu gas by cracking oil. The fixed charges are usually not too excessive because the major part of the plant has been written off. Therefore, fixed charges are at a minimum except for improvements necessary. Demand labor charges are kept to a minimum by transferring plant personnel to distribution work and general building maintenance work throughout the system during the period that the plant is shut down. Also, by taking advantage of low residue naphtha-type feedstock instead of oil, it is possible to further reduce demand and commodity costs because tars and carbon problems are minimized, and make is substantially increased. Though the feedstock may cost more, it is justified for short duration peaks. The major disadvantage to thermal cracking gas is that there is a limit to the amount of gas that may be added to the base load gas because of the different burning characteristics of the gas produced. (This will be covered in future articles.)

Beyond the use of converted water gas facilities, low investment cost liquid petroleum gas facilities may have been available from the pre-natural gas period or new facilities can be constructed. If it were possible to store the summer valley gas economically, it might be possible to not only produce a greater income from firm contract gas but to also provide gas for even the most unexpected peak. In this respect, a great deal of work is being done to investigate possibilities of liquefied natural gas, or the underground storage of natural gas as a low temperature liquid or under high pressure. A possible happy medium between the liquefaction of natural gas (which has many limitations, not the least of which is that it is expensive, due to high demand costs) and the use of purchased LPG (which has a high commodity price with a high unit demand since the facilities might be used but one day or possibly one week per year) is the extraction of ethane from natural gas and the storage thereof. Newly developed molecular sieve adsorbents and processes have put a new emphasis on this possibility.

Other more advanced total gasification processes now being developed using oil and coal feedstocks will be discussed later.

Though there are several trial and error methods for determining the most economical firm gas purchase contract, storage, winter service and peak-shaving capacities, it can be seen without too much difficulty that the firm gas that one can purchase is limited by the valley. And, winter contract gases are limited by the high demand cost because of the low consumption by profitable load. It is necessary then to fall back on low investment peak shaving to meet the short duration peaks that may come but once in several years. Even though advanced methods of calculating the proper firm contracts vs. peak-shaving facilities have been recommended, the proportions of one to the other are usually resolved on the basis of practical considerations such as the availability of written off production facilities and their location and condition, the geography of the system and existing pipe condition and size, load growth, demand and commodity charges of natural gas and the availability of interruptible load, etc.

The most important concepts of gas production and supply have been discussed. The important properties of gas have been presented, and the economic factors contributing to cost and rate structure have been introduced. In part 4 we will look at the transmission and distribution of gas and try to apply some of the things we have learned to derive some interesting relations that might help us see future design trends, and gain some insight into this important phase of the gas industry. ■



Remote reading of industrial gas meters

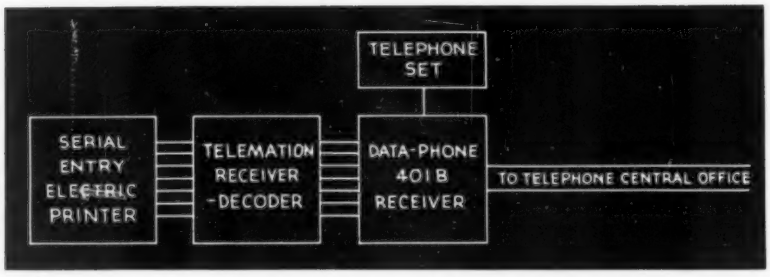


Fig. 1. Control station equipment.

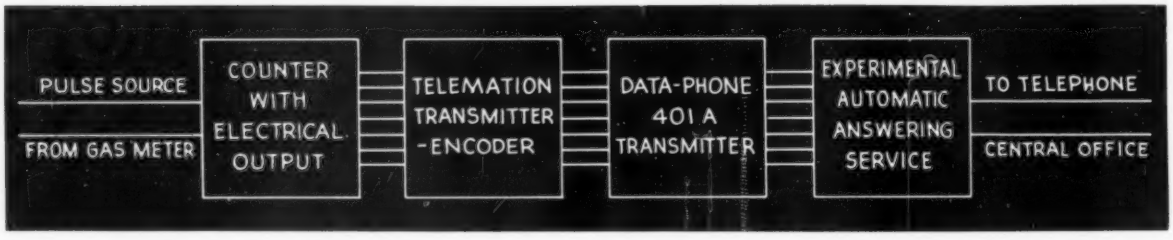


Fig. 2. Remote station equipment.

By Dr. H. SCHIMMEL
Telemation Associates, Flushing, N. Y.

At the Festival of Flame during the AGA convention in Atlantic City last October, Northern Illinois Gas Co. exhibited production prototypes of equipment developed by Telemation Associates for reading industrial gas meters through the regular telephone dial system. The development of this equipment is particularly attributable to the initiative of Earl Tornquist, director of research for Northern Illinois Gas. Several years ago he set out to establish the technical and economical feasibility of such a system of remote meter reading.

Tornquist retired at the end of 1960. The new director of research, Dr. S. R. Milliken, has continued Tornquist's active interest in industrial metering and also has initiated new explorations into the field of remote reading of residential meters.

NI-Gas has 58 large industrial customers whose meters are read daily, including Saturdays and Sundays. These meters are distributed over a wide geographic area, and under present methods the cost per meter read is rather high. Tornquist believed that because of the substantial costs involved, it might be feasible to install equipment for this particular application without waiting for the ultimate reduction in costs which would result from further research and wide application of remote meter reading. Also, other applications for this type of system seem feasible; i.e., dialing unattended stations for information on pressures, temperatures, valve positions, etc. Therefore, in order to obtain operating experience, it was decided to proceed with an experimental installation.

NI-Gas discussed equipment possibilities with a number of interested companies, including our own. At the same time, they explored the communication possibilities with Illinois Bell Telephone Co. Present system specifications were developed as a result of three-cornered conversations between NI-Gas, Bell System staff, and ourselves. The prototype Telemation equipment exhibited at the AGA convention is now commercially available. The system includes a number of unique features—especially its use of the new Bell Data-Phone 400A system. The monthly rental for the new Data-Phone 401A transmitter is about $5, or less than one-fourth that of previously available Bell units. It is expected that this factor alone will insure the economic feasibility of a system installation at NI-Gas. The price of the new Data-Phone 401A does not include automatic answer-

ing feature, which is expected to add an additional $2.50 per month to the rental charge.

SYSTEM DESIGN, OPERATION

The system as presently conceived will consist of a central receiver located at NI-Gas offices and 58 remote transmitters located at customer installations. At the receiving station the equipment consists of a regular dial telephone, a Data-Phone 401B receiver, a Telemation receiver-decoder, and a serial entry electric printer (*Fig. 1*).

At the remote station—in addition to the regular gas meter, whether of the rotary or orifice type—there should be a device which hands off a pulse for each measured unit of gas. This pulse is used to operate a counter with an electrical output where the meter reading is stored. The basic transmitting equipment operating from the above information units are the Telemation transmitter-encoder and the Bell Data-Phone 401A transmitter. Because the remote point is unattended, an experimental automatic answering feature is employed (*Fig. 2*).

In the operation of the system, each remote point is assigned a telephone number. The operator at the central station dials a remote point in the usual way and a characteristic tone informs him that he has reached the remote point. He then switches from voice to a data mode and by pressing a button initiates a transmission of the meter reading, which is immediately printed out. After completing a meter reading, the operator hangs up and then dials the number of another remote point. Actual transmission and printing out of a meter reading take less than a second. It is estimated that the operator will be able to obtain the readings of the entire system of 58 remote stations in less than an hour.

Each transmission includes a code number which precedes the meter reading and identifies the remote station. Also, the printer includes a manual keyboard so that the operator can insert the time of transmission or any other significant coded information right along with the meter reading.

EQUIPMENT DESIGN

This equipment is among the first designed to be used with the new Data-Phone 400A system which employs a 2-out-of-8 code system. In order to give a clear picture of the design of the Telemation equipment, we will first briefly describe the 2-out-of-8 code system.

The Data-Phone 401A transmitter includes two oscillators, each of which is capable of generating one of four code tones in addition to its rest tone. The particular tone generated by an oscillator will be determined by a contract closure (one of four for each oscillator) which is given by the Telemation or other keying unit to the Data-Phone set.

If we label the tones generated by one of the oscillators as A tones and the second group as B tones, then it is readily seen that up to 16 different characters are defined by the simultaneous keying of 2 out of 8 tones. The Data-Phone 401B in response to simultaneous keying of 2 such tones provides at the receiver end a gated closure of 2 out of 8 contacts.

As shown in *Fig. 3*, only 11 of the 16 possible characters were used in the present application.

Telemation transmitter design—Since the maximum speeds of both the Data-Phone 400A system and the serial entry printer were 20 characters per second, and the study at each transmitter was to be light, it was decided to use a stepping switch in the Telemation transmitter for programming purposes. When a call from the central station is automatically answered at the remote point, an initial pulse is provided which starts the stepping switch which then carries out a predetermined program of contact closures. When the switch returns to its start position, it halts and the transmission is over.

At the first step of the program switch, it closes contacts which hold the Data-Phone transmitter on the line until the transmission is completed. At each step of the switch thereafter there is a period of at least 25 milliseconds when two relays are closed corresponding to a particular character being transmitted followed by rest tones; in all 9 characters are transmitted—the first three for station identification followed by one each for each of the five wheels of the counter followed finally by the print command.

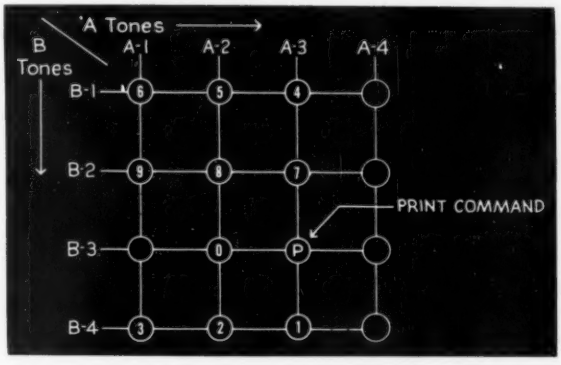


Fig. 3. Codes used in present application; 2-out-of-8 system.

Telemation receiver design—At the receiver end, the Data-Phone unit hands off contact closures to the Telemation equipment which correspond to the characters which have been generated under the 2-out-of-8 code (*Fig. 3*). The Telemation receiver-decoder employs power transistors arranged in the Matrix fashion shown in *Fig. 3*, with the printer coils occupying the positions shown in the illustration as occupied by characters. The Telemation receiver is capable of operating at substantially higher speeds than 20 characters per second.

OTHER APPLICATIONS

One of the interesting applications of the NI-Gas system is that the dispatcher will be able to check customer demand at any time by taking two successive readings separated by a definite time interval. More generally, these Telemation units can be used to bring in over the dial system and print out or operate dis-

plays of various kinds of digital readings at remote stations.

In addition to the special units developed for Data-Phone 400A system, Telemation also has available encoding and decoding equipment for the Data-Phone 102A set and for privateline communications links, including voice grade and telegraph grade, as well as microwave. These form a family of basic encoding and decoding units suitable for a wide variety of system applications where digital codes are employed for data transmission and remote supervision and control.

THE FUTURE

The efforts of Northern Illinois Gas show that with the cooperation of the telephone company and equipment manufacturers, remote meter reading is not only technically feasible but also economical for some applications. When this work began the inexpensive Data-Phone 400A system was not yet commercially available. In fact, we carried out our work with experimental Bell equipment. The availability of the Data-Phone 400A system not only makes applications similar to that of NI-Gas feasible. It also opens the way for on-call telemetry to system points where hitherto a private line has not been justified.

The present devices and system are, of course, not suitable for remote reading of residential meters on a monthly basis because all of the equipment involved —including the counter with electrical output, the Telemation units and the Data-Phone—is too expensive. The present application, however, is an authentic step toward this goal. I firmly believe that concentrated effort by a utility and the telephone company would achieve this goal within two to five years. The successful solution here depends on the development of an economic system, particularly as regards the best use of existing telephone facilities rather than the development of new and ingenious types of hardware. After all, it is possible to turn out in hundreds of thousands lots of devices for a few dollars which manufactured individually may cost a hundred times as much.

It is essential, however, that a major utility or group of utilities exercise some real initiative and that the telephone company grant wholehearted cooperation before any real progress toward remote reading or residential meters can be anticipated. It is true that some initiative can be exercised by equipment manufacturers. But, in any event, the utmost cooperation by the telephone company will be indispensable. ■

Mobile lab-classroom

MATING a mobile home body with a truck chassis, Dodge has produced a mobile laboratory-classroom that should have many possible uses in the various elements of the gas industry. Contractors, geologists, drilling crews, and others serving the industry should also find the unit useful.

Basis of the unique vehicle is a 178-in. wheelbase Dodge D-300 chassis. Included as standard equipment are a 200-hp V-8 engine, three-speed push-button automatic transmission, booster brakes, and dual rear wheels.

On this chassis, Frank Mobile Homes Inc. builds a 26-ft long, 7-ft wide body, which stands 8 ft 5 in., when mounted. Interior dimensions are 20 ft by 7 ft 2 in. Headroom is 6 ft 3 in.

Starting at the front, the body has: tinted safety glass windshield and dual electric wipers; an engine mounted ahead of the front axle; a driver's compartment with two swivel seats; an instructor's seat; four private desks with individual earphones, microphones, and tape recorder; a pair of seats over the rear wheelhouse; two work tables, one with a sink; and—on the outside—storage space for LPG bottles and miscellaneous items. Walls, floor and ceiling are fully insulated and finished in birch paneling. Fluorescent lighting is employed and ventilation is supplied by a total of eight windows and a screen door.

This specialized vehicle is available through any authorized Dodge truck dealer. ■

ABOVE: Looking toward the rear of the mobile lab-classroom from the door, the four desks and one of the work tables are visible. A control panel out of the picture in the foreground enables the teacher to talk to any one pupil or the entire group. BELOW: Exterior of the vehicle.

GAS DISTRIBUTION NEWS

GE unveils new gas load builder

- *first gas turbine package power plant*

Several hundred utility experts and industrialists attended an early-June demonstration of the nation's first gas turbine power plant. Demonstrating this new way to produce large quantities of commercial electric power from gas was the Gas Turbine Dept. of General Electric.

Following the demonstration, the 11,250-kw power plant was shipped to South Carolina Electric & Gas Co., purchaser of four of the units. The combined utility recently constructed more than 200 miles of gas transmission line in its 23-county service area in preparation for the units. Two will be installed at Charleston and two at Burton.

GE designed the package power plant to provide a low-cost, remote-controlled, unattended power source that can be shipped by rail in four major components, installed and placed in service in 10 days, and moved later if necessary.

One of the big advantages of the package concept is that less than 5 per cent of the total cost of the station will be expended for the site. If the load center changes, the entire station can be moved by conventional carriers to a new site. Less than 5 per cent of the initial investment would be left behind and the value of the site could be subtracted from that.

Overall dimensions of the unit are approximately 80 ft long, 22 ft wide, and 16 ft high. The design is suitable for operation at ambient temperatures from a minimum 40 deg. to +120 deg. F. Its acoustic treatment permits operation in a suburban area.

The plant is designed for unattended remote control, but retains provisions for manned operation. Completely self-cooled, it eliminates the need for an external water supply. GE says a building block approach allows it to keep costs low while still allowing for the flexibility necessary to meet individual customer requirements.

Because the unit is expected to meet a wide range of applications and operating conditions, GE says it has built in a greater safety margin than it would in a tailor-made unit.

Gas consumption figures were not made available.

A merger and a purchase

Two big Southern gas companies grew a little bigger in recent weeks.

In mid - June, stockholders of MidSouth Gas Co. voted to merge with Arkansas Louisiana Gas Co. under a plan earlier approved by the boards of both companies. If the plan is approved by federal and state agencies, it will extend Arkla's operating area into the last large piece of Arkansas it is not already serving. That's a 54-county eastern section containing 48,300 customers. Under the proposal, MidSouth stockholders will receive one share of Arkla for every two shares of MidSouth.

A very much smaller acquisition was made by Lone Star Gas Co. in late May. It bought the Lakeview Gas Co., which serves 200 customers in two Texas Panhandle towns.

To refund or not to refund

Rejected refunds, approved refunds, and refunds per se have all been in the news in recent weeks.

Rejected refunds totaling $18.4 million were offered by El Paso Natural Gas Co. to Californians. The California PUC turned down this compromise settlement of three subject - to - refund rate increases under which El Paso collected $205 million from April '55 to Aug. '60. The commission staff estimated the $18.4 million offer to be "far below" the amount due.

Approved refunds of $95,000 will have to be paid by Missouri Natural Gas Co. to customers who received gas between Jan. 16, '59 and Aug. 12, '60, Missouri's PSC ruled. The refund reflects a rate reduction received by the utility from its sole supplier, Mississippi River Fuel Corp., but not passed on to its customers.

Refunds, per se, are the target of a bill announced by Sen. Joseph S. Clark (D., Pa.). The bill would help eliminate refunds by eliminating gas pipeline rate increases subject to refund. It would empower FPC to block increases until they are studied and approved.

Gas hit of restaurant show

Gas made the biggest showing of all at the 42nd annual National Restaurant Association convention and exposition in Chicago late in May. Occupying nearly 5000 sq ft, the AGA combined commercial gas exhibit was the largest there and was also the largest ever sponsored by the industrial and commercial gas section.

Eleven manufacturers cooperated by showing their latest heavy duty cooking equipment and accessories. Two companies attracted unusual attention.

Mid - Continent Metal Products Co. "aroused much interest" with a live cooking demonstration of its Ember-Glo Char broiler. The unit is equipped with a special air blast to "practically eliminate" the flare from dripping fat hitting hot ceramic.

South Bend Range Corp.'s infra-red broiler and infra-red range "literally stopped the show," according to AGA. The broiler sizzled a 1-in. steak to medium rare in 4½ min., the top of the closed-top range was red hot in 12 min.

Provides trouble-free service for years

Decade after decade, cast iron pipe gets gas to where it's going—efficiently—trouble-free. Cast iron pipe rarely needs attention after installation.

It's a simple story of ruggedness.

Rugged outside: cast iron pipe withstands all the usual stresses to which underground pipe is normally subjected.

Rugged inside: bottle-tight mechanical joints remain tight under all normal distribution pressures.

And the ruggedness lasts. The cast iron gas mains you install today will still be operating when your great-grandchildren have grown up.

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CAST IRON PIPE RESEARCH ASSOCIATION

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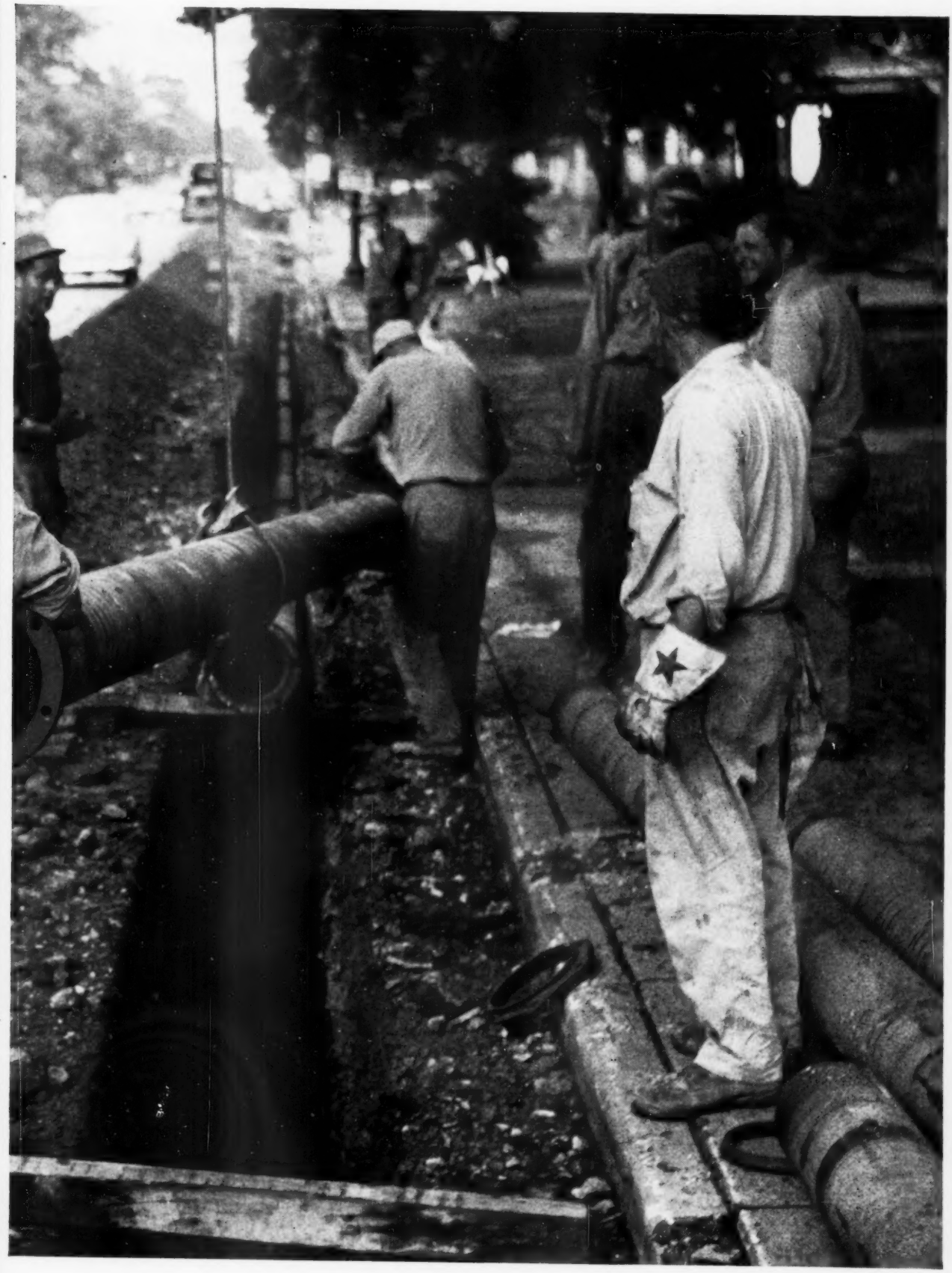


Gas firm, Miami agree on new lower rates

Miami's two-year-old rate battle with Houston Gas Corp. (now Florida Gas Utilities Co.) has ended. Both sides signed a peace treaty said to give consumers a new $23,000-a-year saving.

Terms of the agreement call for:

Reduction of minimum rate to $1.50 per month, plus other rate cuts, for a total consumers saving of some $9000 yearly.

Elimination of a proposed $2 collection charge, coupled with a boost from $2 to $2.50 for disconnections. Florida Gas estimated customer savings at $4000 a year.

Abolition of the regular $2.50 service charge when call is limited to a search for gas leaks. Estimated customer saving: $10,000 annually.

The rate changes will result in identical price schedules for both residential and commercial customers. Until now, commercial users have paid lower rates.

Florida Gas, admittedly operating in the red, said the new concessions are a move to win greater community acceptance.

Symonds and Todd named by Stanford

Raymond W. Todd, vice president for operations, Pacific Lighting Gas Supply Co., Los Angeles, and H. Gardiner Symonds, chairman of Tennessee Gas Transmission Co., Houston, are members of Stanford University's mineral sciences visiting committee.

The committee, which will meet regularly and act as an informed and friendly observer and critic, will provide liaison with the industry and scientific community.

Rain doesn't dampen promotion

Despite five days of rain, during which more than 10 in. fell, employees of Western Kentucky Gas Co. made the company's second Gaslite Promotion Day a booming success.

More than 6000 customer contacts were made by 365 employees. From the contacts came 1263 Gaslite sales.

The procedure used for this Gaslite Day was to have district managers hold a brief meeting with their employees on the day before the promotion. Every employee was requested to ask at least 10 people to buy a light.

The accompanying photo of Bill Spurrier with a Gaslite mounted atop his personal car is a typical example of the enthusiasm and ingenuity the employees used to build their astounding total of sales.

Michigan, Panhandle fight continues

A bill which would have required a utility to secure a favorable vote of citizens in a special election before it could enter a city already served by another utility has been killed by the Michigan house state affairs committee.

The bill was sought by Michigan Consolidated Gas Co. to protect its industrial gas market from direct sales by Panhandle Eastern Pipeline Co.

A hearing on the bill brought charges from PSC chairman George E. Hill that the two companies have spent millions of dollars of ratepayers' money for carrying on their 15-year fight for control of industrial gas markets.

Michigan Consolidated wanted to stop Panhandle's attempt to secure permission from the Dearborn city council and the PSC to furnish gas to Ford Motor Co.'s Rouge plant. The gas would be sold at 7 cents per Mcf below that now charged by Consolidated.

Storage bill passed

The Michigan legislature passed a bill allowing natural gas companies to obtain approval of only 75 per cent of the landowners in a proposed gas storage area before resorting to condemnation proceedings.

Heretofore, the companies had to line up agreements with 90 per cent of the landowners before starting condemnation proceedings.

PUC sets up new bureau

Pennsylvania's PUC is forming a bureau to speed investigation and action on utility service complaints and tighten enforcement operations.

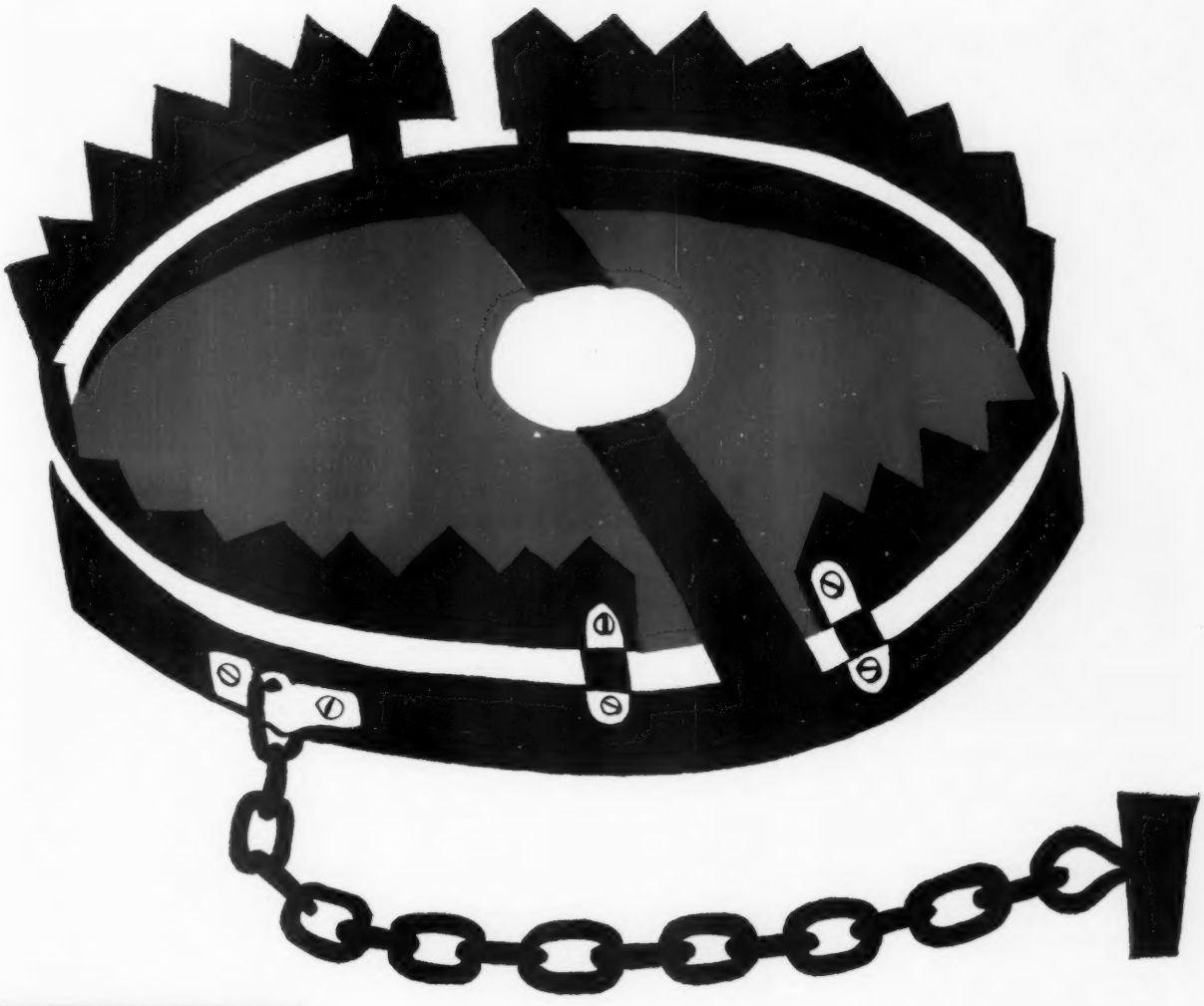
The new bureau of investigations, service, and enforcement represents unification of investigation and enforcement work for the first time in the commission's history. It is believed to be the only one of its kind among the nation's regulatory agencies.

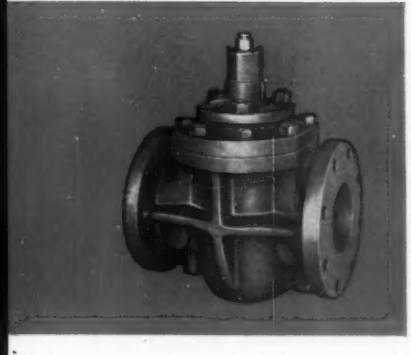
AGA sponsoring Women's Congress

The fifth Women's Housing Congress is scheduled for Sept. 18-21 in Washington, D. C.

General subject for discussion by an expected 150 "Congresswomen" will be home modernization.

AGA is among the associations sponsoring the modernization congress. Delegates will be selected through "Be a Congresswoman" contests in some 150 communities in August. Local contests will be spearheaded by AGA members, with tie-in participation and support from local members of the other sponsoring associations.





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NEWS PIX

Easter Island heads crowned with fiery halos provided by natural gas flank the main entrance to Columbus, Ohio's new million dollar Polynesian supper club, the Kahiki. A dozen gas-fueled luau torches decorate the winding drive and main entryway. The modern kitchen uses gas-fired cooking equipment exclusively.

Atlanta (Ga.) Gas Light Co.'s newest office in Norcross, Ga., is identified with this Gasign. The main entrance, shown in background, also has a gas light on either side.

Philadelphia Electric president R. G. Rincliffe, starts the pusher that released the last load of coke before the plant was closed recently. During shutdown ceremonies, Rincliffe said research disclosed it was more economical to purchase natural gas and to increase the capacity of the nearby Tilghman Street plant than to continue the use of the gas from the coke ovens. The coke oven plant site will be used by Philadelphia Electric as headquarters for gas and electric distribution servicemen serving the area.

New York State Natural Gas Corp. president Richard J. Plank unwraps the National Safety Council "Winner Award" for 1960. The Pittsburgh-based company ranked first among public utilities reporting to the council. It topped the list of gas companies in its class (those working between 540,000 and 1,680,000 man-hours yearly) by completing 1960 without a lost-time injury. Looking on are Safety Director Darwin E. Whipkey (left) and Donald L. Barger, superintendent of operations.

IGT's Elliott to address measurement school

Dr. Martin A. Elliott, director of the Institute of Gas Technology, will be the principal speaker at the opening session of the 21st annual Appalachian Gas Measurement Short Course. The three-day school is planned for Aug. 28-30 at West Virginia University in Morgantown.

More than 50 gas equipment manufacturers will exhibit at this school. Basic as well as advanced classes will be conducted in all phases of measurement, regulation, and metering practices.

Detailed information on the school is available from Prof. R. E. Hanna at West Virginia University.

Immediate service wins franchise

Kootenay Gas Utilities Ltd. has been granted approval by British Columbia to build a $3 million gas distribution system to serve five cities in the East Kootenay area of the province.

The franchise also was sought by Cascade Utilities Ltd., Great Northern Utilities and Inland Natural Gas Co. Ltd. Kootenay Gas won the franchise because it was the only applicant offering unconditional service to the entire area immediately. Some of the other applicants suggested progressive service.

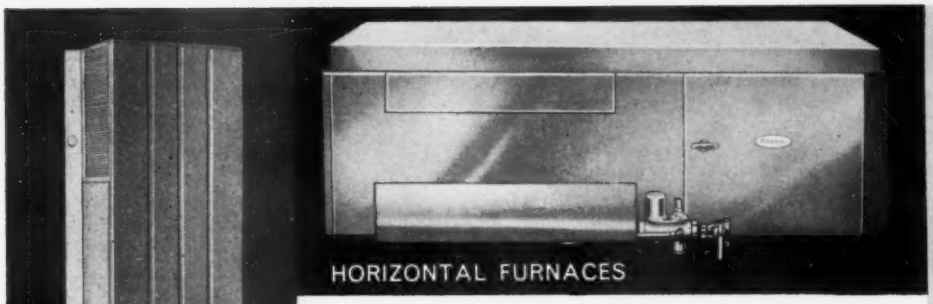
Kootenay's gas supply will come from Alberta Natural Gas Ltd.

Air conditioning show hits the road

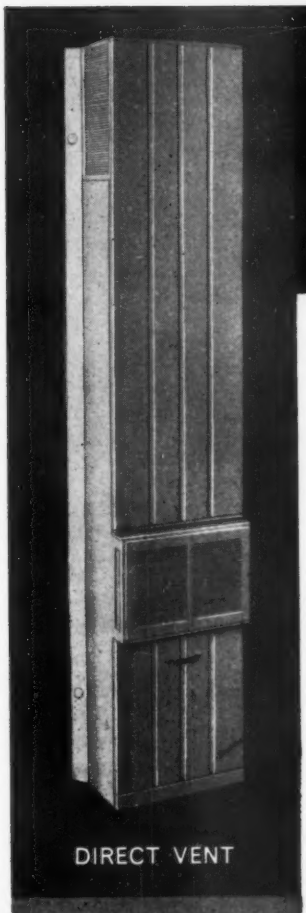
Vaudeville-type showmanship, combined with a comprehensive educational program, is being used by Arkla Air Conditioning Corp. to intensify "gas air conditioning consciousness" throughout the gas industry.

Company representatives are touring the country with the Arkla Road Show, a series of oral presentations and skits dramatizing the main phases of gas air conditioning sales and describing proven successful sales programs.

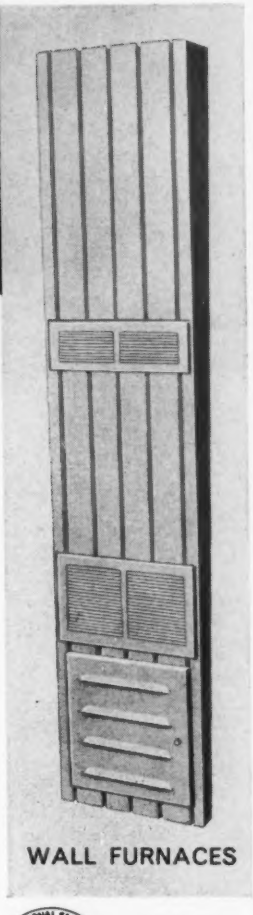
Arkla is also making the Road Show scripts and slides available to gas company and dealer customers to use in making presentations to their own employees, customers, and others.



HORIZONTAL FURNACES



DIRECT VENT



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Advanced engineering, quality construction, competitive pricing, all mean more sales opportunities for you.

Empire cuts installation cost up to 15%, service costs up to 70% less.

You keep up to 20% more profit. It will pay you to write today for the complete Empire selling plan.

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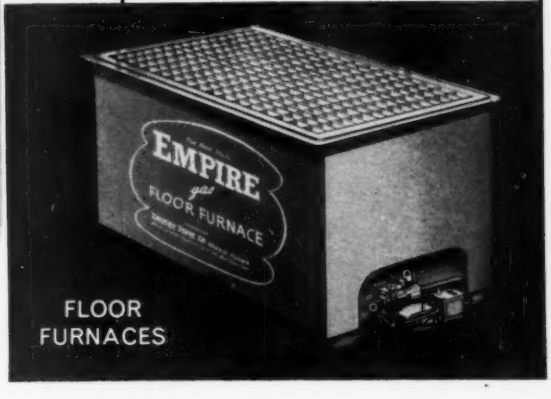

FLOOR FURNACES

Naugatuck people taking part in the Los Angeles sales clinic were (l to r): C. M. Churchill, Eli Schwarz, Arthur Thomas Jr., and R. W. McIntosh.

Kralastic extruders study gas industry

Eighty plastics pipe salesmen, representing all 28 firms extruding Kralastic ABS plastics pipe, became better acquainted with the gas industry during a pair of day-and-one-half sales clinics in late May. Twin clinics were staged in Cleveland and Los Angeles by the suppliers of Kralastic, the Naugatuck Chemical Division of United States Rubber.

The gas industry thus became the first industry selected for a comprehensive program outlined by R. W. McIntosh, marketing manager for Kralastic pipe:

"As part of our sales promotion program, we . . . will teach our manufacturers' salesmen how to sell in certain industries and will also make the consumers in these industries more aware of plastics pipe through installation handbooks, advertising, and educational films. We are inaugurating two series of sales clinics with two for the gas industry, which is one of the most important markets for plastics pipe."

During the clinics, McIntosh outlined just how important the gas industry is to the plastics pipe people—and, perhaps, vice versa. If plastics could gain the gas industry's total mains and services market, that would amount to $154 million and a material saving of $27.2 million to the utilities. "A reasonable target plastics pipe can hope to reach in 6 or 7 years" is half that market, or $77 million per year. If plastics pipe reaches that goal, McIntosh says the gas industry will save annually $40.8 million, including materials costs of $13.6 million and installation costs of $27.2 million.

In launching its program to go after this market, Kralastic has: stepped up its advertising program, begun a direct mail campaign to 5500 key personnel in gas distribution companies, published a 32-page Gas Installation Handbook, and produced an educational film, "16,000 Miles." The last two items were key features of the sales clinics.

The handbook will be covered in considerable detail in a future issue. Among its most interesting portions are: an explanation of the effect of ground temperature on plastics pipe, along with a chart showing safe operating pressures at elevated temperatures; a chart showing the flow of natural gas in plastics pipe, a series of diagrams for various types of service installations, and a picture sequence showing how plastics pipe repairs may be completed in 20 minutes by pipe-pinching methods. Probably the most controversial portion of the handbook will be Naugatuck's recommended standards and specifications for plastics pipe to be used by gas utilities.

The movie title, "16,000 Miles," symbolizes the more than 16,000 miles of Kralastic ABS plastics pipe now in the ground. The film shows—in considerable detail—the manufacturing operation, then goes into specific uses with much footage devoted to gas mains and services. Twenty-four copies of the film will be available through Kralastic extruders.

GAS • News Notes

Boston (Mass.) Gas Co. wants to provide gas service to the towns of Carlisle, Roxborough, Harvard and Shirley. All four towns are adjacent to Boston's service area.

An AGA-sponsored film showing how to prevent accidents caused by static electricity has been given an Award of Merit by the National Committee on Films for Safety. "Static Electricity," produced with the cooperation of the U. S. Bureau of Mines, explores research by government and industry aimed at controlling static electricity.

Textron Inc., has acquired Sprague Meter Co., Bridgeport, Conn. Sprague will operate under its present name as a division of Textron. William A. Haist, Jr., continues as president of Sprague.

Robertshaw - Fulton's new plant near Youngwood, Pa., has been selected by *Factory Magazine* as one of the "Top Ten" manufacturing plants completed in the U. S. during 1960.

New York's PSC gave authority to Iroquois Gas Corp., Buffalo, to buy gas franchises, works and system of Penn-York Natural Gas Corp., an affiliate. Sale price: $814,000.

Grove Valve & Regulator Co., Oakland, Calif., was presented an award for outstanding employee safety achievement by the Pacific Employers Insurance Co.

Work has been completed on Ohio Fuel Gas Co.'s $44,000 pipeline project to increase gas deliveries to an industrial customer in Fremont, Ohio.

AGA's Gold Star standards for gas ranges have been given the *Good Housekeeping* magazine Guaranty Seal, which appeared in combination with the Gold Star Award in the June issue of the magazine.

Government certified inspectors are required to approve all natural gas installations, the Ontario Energy Resources Board has ruled. Responsibility for inspection, however, still remains with the company involved.

everyone knows these two symbols of reliability!

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Guaranteed by Good Housekeeping
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GAS·PEOPLE

Lone Star Gas Co. is expanding the sales and promotion department of its Dallas division of distribution. JOHN F. MOORE, former chief engineer, is now general sales and promotion manager. The division's industrial department becomes a section of the sales and promotion department under the supervision of A. B. MCCURDY, division industrial engineer. B. R. HATLEY, former assistant general sales and promotion manager, becomes merchandise sales manager. H. A. CONNOR, former supervisor of the architect and builder assistance section, becomes promotional projects manager.

WILLIAM G. WEPFER, general sales manager of Arkla Air Conditioning Corp., has been elected a vice president. He will retain his duties as general sales manager.

CHARLES J. SINNOTT, general sales manager of New Orleans (La.) Public Service Inc., has been elected a vice president. RICHARD W. FREEMAN, president of the Louisiana Coca-Cola Bottling Co., is a new director. Sinnott has been with NOPSI since 1937.

FRANCIS F. HILL has been elected vice president and general counsel of Northwest Natural Gas Co., Portland, Ore. Hill has been a member of the law firm of Smith, Gray, Hill & Rodgers, which (along with its predecessors) has represented Northwest since 1910.

WILLIAM R. MCLAUGHLIN regional sales manager-southwestern region has been named manager of the newly created new products division for Rockwell Manufacturing Co.'s meter and valve division. He will headquarter in Dallas. As a result of McLaughlin's new assignment, JAMES SELLS becomes regional manager-southwestern region; WILLIAM HENRY becomes district manager, Houston, meter and valve division, replacing Sells; and PAT LUCKETT replaces Henry as Houston district manager, municipal & utility division.

JAMES A. MILLER moves from director of engineering to vice president in charge of engineering research and development of Motec Industries Inc., Hopkins, Minn. MARSHALL E. MUNROE JR., director of procurement, has been elected a corporate vice president of the company.

Officers of the reorganized Western Power & Gas Co., were elected recently. They include: Max MCGRAW, chairman; JUDSON LARGE, president; L. D. DENSMORE, TORAL F. DUCKETT, and D. B. HYER, JR., executive vice presidents; KENNETH L. DALLY, DUANE T. SWANSON, and WILLIAM PORTER, vice president; LEONARD T. NELSON, secretary-treasurer; KENNETH L. POHLMAN, controller; M. A. HARDIES and R. M. MILLER, assistant secretary-assistant treasurer; and KEITH L. KNUDSEN, assistant secretary.

GEORGE L. CLEMENTS, president of Jewel Tea Co. Inc., and C. VIRGIL MARTIN, president of Carson Pirie Scott & Co., are new nominees for directors of Northern Illinois Gas Co. Two openings on the board were created by the retirement of EDGAR E. LUNGREN, former NI-Gas executive vice president, and CARL J. SHARP, former chairman of Acme Steel Co.

LEE H. CLARK, group vice president-east, Pennsalt Chemicals Corp., has retired after 32 years of combined service with Pennsalt and with Sharples Chemicals Inc., before the latter became a part of Pennsalt in 1951. He served as president of Sharples prior to the consolidation.

GORDON SODORFF has joined Adams Pipe Repair Products, South El Monte, Calif., as regional sales representative in Oregon, Washington, Idaho, and Montana. He headquarters in Portland, Ore.

FRANK A. SPEER has been named vice president and works manager of Mueller Co., Decatur, Ill. Speer will direct manufacturing operations for all Mueller domestic facilities.

Maxitrol Co., Detroit, has named GORDON BERRY plant manager of its new manufacturing facilities in Blissfield, Mich.

DANTE E. BROGGI, vice president, has been elected to the board of directors of American Meter Co.

E. B. WILDER has transferred to Atlantic Gas Light Co.'s Cedartown office as assistant manager. He is slated to succeed DAN ADAMS as Cedartown manager upon Adams' retirement next year. Succeeding Wilder as manager of the Carrollton office is W. T. RUSSELL, manager of the Rockmart office.

John Perryman
Lone Star

J. V. Guido
Motorola

JOHN PERRYMAN heads Lone Star Gas Co.'s newly formed area development department. Perryman was sales and promotion manager of the company's Dallas division of distribution.

ROBERT ANDERSON, former Secretary of the Treasury, has rejoined the board of directors of Dresser Industries Inc., Dallas.

H. J. PERKNER was named comptroller, W. M. GAMBLE named assistant comptroller, and H. M. BARRETT named purchasing agent of Delaware Power & Light Co., Wilmington.

PAUL SELBY and GORDON M. HENDERSON have joined Ridge Tool Co. as sales representatives. Selby will cover Quebec and the Maritime provinces while Henderson represents the company in Florida.

Motorola Communications & Electronics has made three promotions within its Pacific Northwest sales organization. JOSEPH V. GUIDO is regional sales manager. D. EDWARD WILLIAMS succeeds him as account executive in Washington and Oregon. Moving into Williams' former post as Seattle zone sales manager is ROBERT H. MAKI.

HOWARD HOLE, former plant superintendent for Honolulu Gas Co., has rejoined the company as planning engineer. For the past year Hole has been on leave of absence, serving as consultant to the Anchorage (Alaska) Natural Gas Co. Honolulu Gas also named CHARLES R. WOODS new Isle Gas operations engineer.

EVERETT M. HOLWICK has been elected assistant comptroller of Northern Illinois Gas Co.

SELDEN A. STONE has been named assistant drill sales manager for Bucyrus-Erie Co., South Milwaukee, Wis.

FRANK H. POST, vice president and general manager of Robertshaw-Fulton's Robertshaw Thermostat division, in western Pennsylvania is moving to Richmond, Va., as vice president, marketing. He will organize a new national sales organization to market several new lines of Robertshaw products. ARNOLD C. HANSON will take over Post's responsibilities as general manager at Robertshaw Thermostat. Hansen also has been elected an assistant vice president of the corporation. Most recently he has been assistant to the general manager of Robertshaw's Grayson Controls division in Long Beach, Calif.

RICHARD T. ALT has been appointed eastern district manager of Superior Meter division, Neptune Meter Co. He will cover the New England states, New York, eastern Pennsylvania, Maryland, and the District of Columbia.

CHARLES F. BRISCOE, manager, distribution, Southern Counties Gas Co., Los Angeles, has been cited by Lt. Gen. George W. Mundy, USAF, Commandant of the Industrial College of the Armed Forces, for having completed the college's correspondence course with honors.

Soft as Moonlight...

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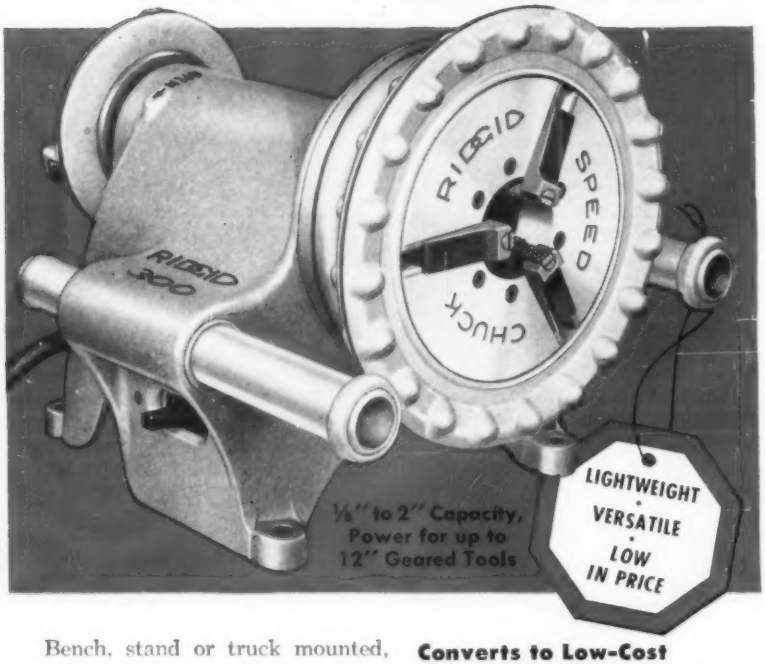
RIDGID® 300 Power Drive



Bench, stand or truck mounted, this compact RIDGID 300 Power Drive quickly pays for itself in time and labor savings. Speed chuck closes and releases by hand . . . holds tight forward or reverse. Cam-action rear workholder holds even long lengths straight for perfect threads and cuts every time.

Converts to Low-Cost Threading Machine

Add the RIDGID No. 310 Carriage, No. 360 Cutter and a RIDGID Quick-Opening Machine Die Head, and you're ready to cut, thread and ream. With a No. 19 Nipple Chuck you even cut and thread close nipples with threading machine speed and ease.

DRIVES GEARED THREADERS · THREADS CLOSE NIPPLES

Call your Distributor today. For your convenience, he maintains a complete stock of RIDGID Work-Saver Pipe Tools and parts!

RIDGID

The Ridge Tool Company, Elyria, Ohio, U.S.A.

GAS Pipeline People

PAUL R. DES JARDINS has been appointed manager, engineering planning, by Worthington Corp., Harrison, N. J.

EDWARD W. REIF has been named regional sales manager and THOMAS F. CASEY JR. account executive, mid-continent region, by Black, Sivalls & Bryson Inc.

JOHN A. FERGUSON has retired as executive director of the Independent Natural Gas Association of America. He will assume the newly created post of consultant to the board of directors and assistant to the president. Ferguson has held the office of executive director since INGAA was organized in 1944. LAWRENCE H. GALL, general counsel, has assumed the duties of acting executive director.

ROBERT J. DUNBAR has been elected vice president-operations of Algonquin Gas Transmission Co., Boston. Most recently, Dunbar has been general superintendent.

ROBERT W. LOWELL has been appointed manager of Bristol Co.'s supply department. Most recently he has been project engineer on telemetering equipment and electrical instruments.

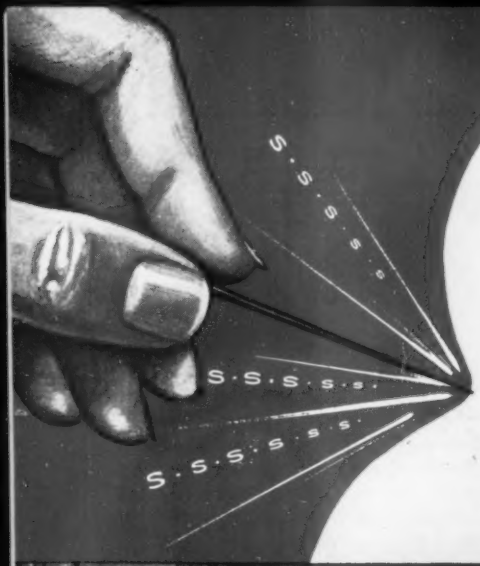
GEORGE F. ROGALA is assistant secretary of Grove Valve & Regulator Co., Oakland, Calif.

C. RAY GROSVENOR has joined Williams Brothers Co., Tulsa, to conduct special studies relating to development of diversified project interests in the petroleum processing and transportation field.

MURRAY P. ELLIS has been appointed regional sales manager, covering Michigan, Ohio, West Virginia, western New York, and western Pennsylvania, for Royston Laboratories Inc., Pittsburgh.

A. W. BREELAND, T. S. BACON and CHARLES G. BARNDT have been elected directors of Lone Star Producing Co.

Trans-Canada Pipe Lines Ltd. has elected WILFRID GAGNON, W. P. SCOTT, and SMILEY RABORN JR. as directors of the company.

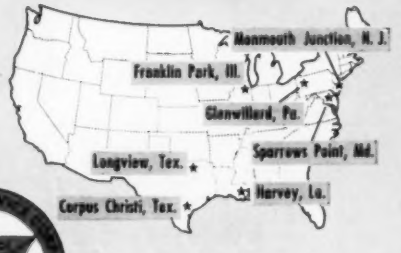


Pinholes are fatal in pipe protection, too!

• Electrical Inspection (arrow) is provided during processing of pipe. This automatically inspects the coating as it is applied, and guards against all "holidays" in the protection.

Pipe Line Service Methods eliminate costly failures of hit-or-miss pipe coating

Electrical Inspection is another PLS control for unvarying quality. This steel mesh screen, designed by PLS Engineers, is charged with thousands of volts. Every square inch of coated pipe passes under this screen and is electrically tested. When voids or holidays in the coating do occur, they are immediately detected and properly repaired. Scientific thoroughness by PLS provides you with uniform protection on every pipe length. Get full details from the Pipe Line Service sales office nearest you.



Sales offices at all plant locations . . . and
Atlanta, Georgia—Dallas, Texas
Lincoln, Nebraska—Houston, Texas
Syracuse, New York

Pipe Line Service Corporation

General Offices and Plant: Franklin Park, Ill.

Quality pioneers in coating and wrapping pipe for a quarter century

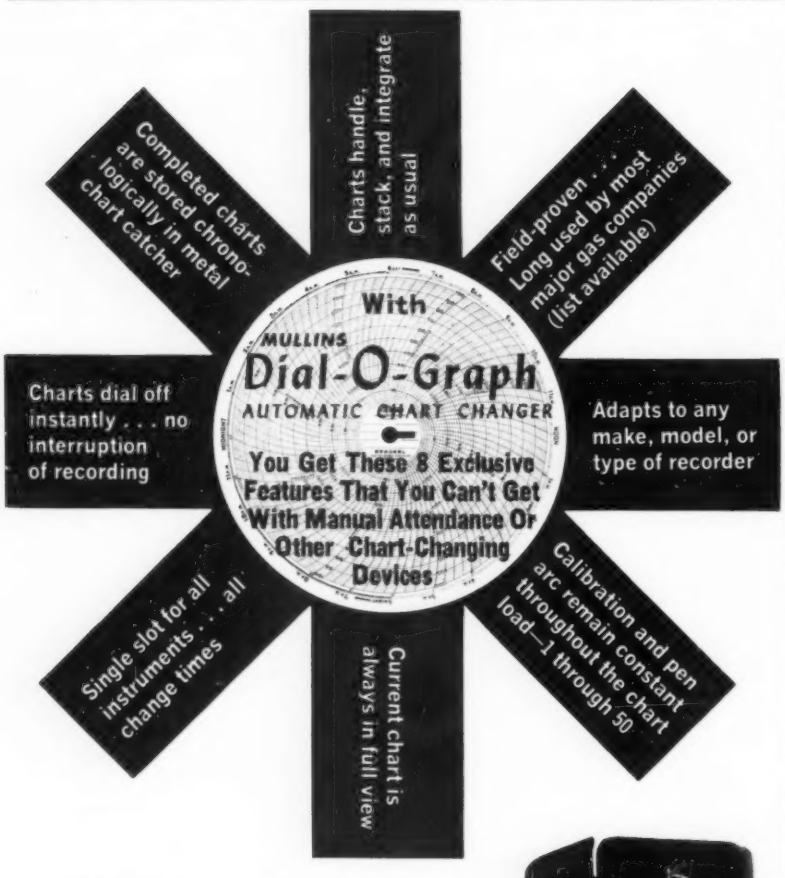
V. W. Meythaler
Texas Gas

F. K. Rader Jr.
Texas Gas

H. F. Keith
Texas Gas

R. C. Young
Texas Gas

G. W. Anders
Texas Gas


Charts handle, stack, and integrate as usual
Completed charts are stored chronologically in metal chart catcher
Field-proven . . . Long used by most major gas companies (list available)
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AUTOMATIC CHART CHANGER
You Get These 8 Exclusive Features That You Can't Get With Manual Attendance Or Other Chart-Changing Devices
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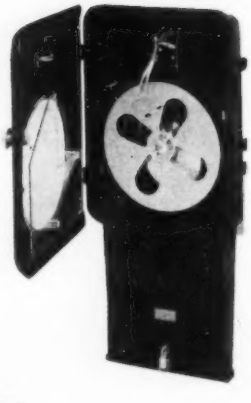
Dial-O-Graph is the best-designed, most efficient and dependable chart changer you can install. You get more features . . . more value . . . and more for your money than with any other chart-changing method. You can rely on getting superior field service, too . . . just ask anyone who has installed Dial-O-Graph Automatic Chart Changers (we'll be glad to send you a list of users in your area).

Whether you want to automate just one, or every recorder in your entire system, Dial-O-Graph is worth your investigation. Write us, and we'll promptly send you full details without obligation.



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AUTOMATIC CHART CHANGER
MULLINS MFG. CO., INC. • 3311 WEST DAVIS • DALLAS 11, TEXAS

VIRGIL W. MEYTHALER and FRANKLIN K. RADER JR. have been elected to the newly created posts of senior vice presidents of Texas Gas Transmission Corp., Owensboro, Ky. Rader became vice president of Texas Gas in 1957 after a period as assistant to the executive vice president. Meythaler has been vice president of Texas Gas since 1959.

HENRY F. KEITH has been elected a vice president of Texas Gas Transmission Corp. He is in charge of the company's purchasing, stores and aviation departments. The newly created post of staff assistant to the president is being filled by RICHARD C. YOUNG and GEORGE W. ANDERS. Young, former assistant to the vice president, will be concerned primarily with the company's diversification projects. Anders' principal duties in his new post will relate to financial relations activities.

WILLIAM C. KEEFE has been elected vice president and secretary of Panhandle Eastern Pipe Line Co. and Trunkline Gas Co. With Panhandle since 1950, Keefe was named secretary of the company and its subsidiary in 1956.

CHARLES E. LAMAR has been appointed executive vice president of the Southern Pipe division of U. S. Industries Inc.

Deaths

JOSEPH F. SULLIVAN, 63, advertising production manager of Minneapolis-Honeywell's Industrial Products group, of a heart attack. For many years he was advertising manager of the Brown Instruments division.

GAS • ASSOCIATIONS

Philadelphia hosts distribution men

SOME 1400 gasmen and manufacturers converged on Philadelphia in May for the AGA's combined distribution - production conference at the Sheraton hotel. There, in a week-long meeting, roughly 100 reports, papers, and panels were presented.

The distribution papers heard ranged from "Joint Coatings for Mill Coated Pipe" to "The Economics of Outdoor Installations" to "A New Approach to Pinpointing Gas Leaks with Sonics." The production papers went from "The Process and Economics of Storing Propane" to "A Study of Automation as Applied to High Btu Oil Gas Production" to "Oil Foggers—New Developments."

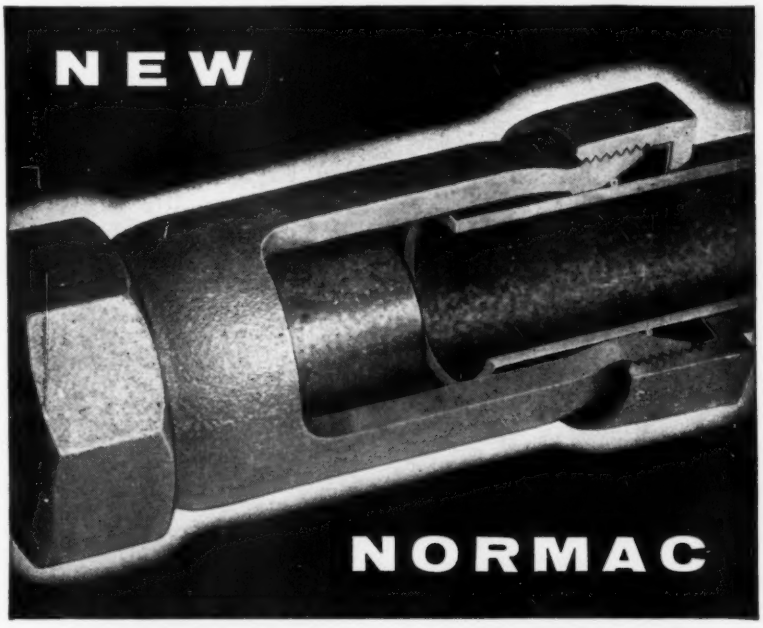
One of the sessions that was of particular interest was that on the "Remote Reading of Meters." A. Brothman and W. Cooperman of Industrial Process Engineers Inc., gave a talk and demonstration of what was called a "Home Data System," developed by their company. They showed how their device simply uses a rod which takes off from the meter to a circular commutator ring. Electrical contacts around the commutator ring provided meter readings. It was stated that a meter manufacturer attested that the rod and commutator had a null drag on the meter.

These readings were in turn transmitted to the meter reader via the regular telephone wires. The readings, which are ideally transmitted during the hours of 2-6 a.m., came in two 4-digit sequences, four providing the address of the meter and four for the meter reading. These readings were then punched out on paper tape to then be read into a computer.

On the subject of costs, Brothman said the reading units would sell for about $20 each. This could be amortized in about 16 years as he estimated the equipment would result in a reduction of around 50 per cent of present manual methods of meter reading. It was reported that one telephone company has given a tentative figure of 5 cents per call plus a 50-cent annual service charge.

In answer to a question from the floor as to who would own these meter readers, the following possibilities were offered, in this order: (1) the telephone company; (2) the gas utility; (3) some sort of telephone answering service, which could be set up to read the meters, punch the tapes and provide the utility with informational readouts; (4) a data service organization which would do the job of reading meters—completely through to the final billing.

Another meeting which proved interesting was that of the sub-committee on plastic pipe standards. Chaired by Charles S. Spencer, Michigan Consolidated Gas Co., he opened the meeting with the question: "Where do we need to change



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All-Malleable COUPLING
Provides More Deflection Than Ever

Engineered in line with latest data on distribution pressures and installation ease. Inspect its construction and quality materials in detail. (Available with Normac INSULATING gaskets).

BRASS FITTINGS
IRON BODY COCKS
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SELF-LOCKING JOINTS
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Maximum stab. All sizes, with or without insulating gaskets. Also in brass 1¼ I.P.S.

BRASS FITTINGS
The most complete line for copper or plastic tubing in ⅝, ⅞, 1⅛, 1⅜ O.D., 1¼ I.P.S.

Top Quality for 22 Years in Gas Distribution Equipment

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PERMANENCY Rely on NORTON-McMURRAY for the finest! NORMAC continues to modernize and improve couplings and fittings in step with latest gas distribution demands. 22 years experience concentrated on ONE purpose . . . the BEST! Today, major gas distribution companies say "NORMAC" to define their standard of quality.

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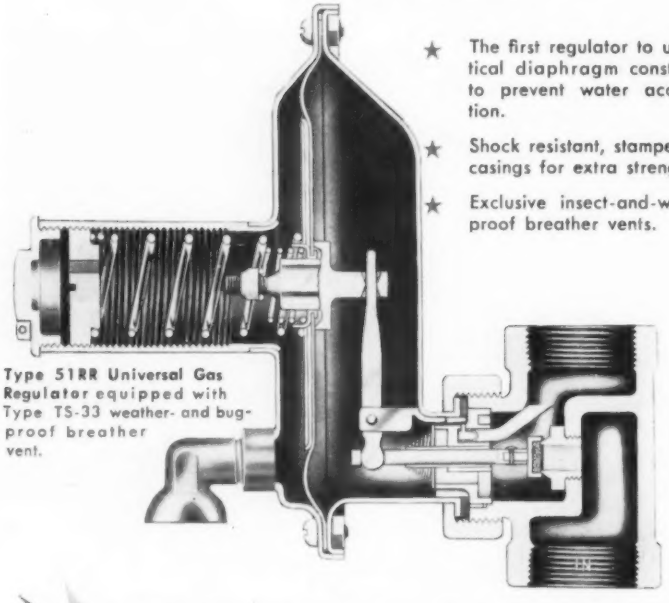
Thorough reliability — one of the many advantages of UNIVERSAL Gas Regulators — is fully assured by a complete factory testing program. Along with checks for material and workmanship quality, testing includes actual performance — not of randomly selected samples — but of each and every Regulator. This assures reliability you can count on, and accounts in a large measure for the ever-growing number of UNIVERSAL Regulators in service. Evaluate the advantages they offer you.



Type 51RR Universal Gas Regulator equipped with Type TS-33 weather- and bug-proof breather vent.

★ The first regulator to use vertical diaphragm construction to prevent water accumulation.

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the 1956 standardization report, if we do?" He said it was the consensus of those he had talked to prior to the meeting that "everything in that report was still valid today."

One of these standards he noted as being still valid was that of 1000 psi fiber stress "which gives us," he said, "the safety margin required for all types of plastics pipe except CAB." At that point, Russell McIntosh, Naugatuck Chemical division of U. S. Rubber, said, "We could go to 1200 psi in PVC and ABS. Long-term testing by the Society of Plastics Institute has shown this to be practical." He then noted that the SPI was itself going to make such a recommendation as of Jan. 1, 1962.

When this last fact was brought out, it became the pleasure of the group to withhold any revisions in standards they might be considering until after SPI makes its report. It was felt that in this way, the subcommittee's recommendations and those of the SPI would be more closely aligned.

Before adjourning, Spencer asked those present to help him form a task group within the subcommittee with the objective of creating a dictionary that would clearly define and standardize the plastics pipe industry's terminology for gas industry representatives. Such action was taken.

L. T. Potter, president of AGA and Lone Star Gas Co., delivered the keynote address at the opening of the conference. In it, he told how the gas industry has tripled its size in the past decade and that it can expect even greater growth without supply problems in the future. "There is no foreseeable supply limitation which would affect the natural gas industry's ability to expand and provide additional energy for the nation," he said.

One of those demands will come from the gas industry's ability to produce any electricity needed for its appliance operation through built-in thermoelectric and thermionic devices. This point was made by T. L. Robey, the association's director of research.

"These devices," he pointed out, "will not only introduce new and possibly cheaper methods of controlling gas appliances electronically, but they will also allow the individual appliance to be completely independent of outside power sources and therefore not subject to failure whenever electric power service is interrupted."

William Harper

Dallas preparing for AGA convention

AGA and Dallas expect 4000 delegates and guests at the 43rd annual convention, Oct. 1-4. This is the first AGA convention ever held in Texas.

AGA will use four Dallas hotels during the convention. The all-gas Statler Hilton will serve as headquarters for the general management section. The Statler ballroom will be the site of at least two of the three general sessions. The residential gas section and the industrial and commercial gas section will maintain headquarters at the Sheraton-Dallas; the operating section will be at the Adolphus; the accounting section at the Baker.

GAMA product groups name chairmen

Chairman of 17 product divisions of GAMA have been named. They are:

Automatic controls, R. A. Sherer, White-Rodgers Co., St. Louis; automatic gas disposers, LeRoy Klein, Caloric Appliance Corp., Wyncote, Pa.; direct heating equipment, Robert H. Norris, Dearborn Stove Co., Dallas; domestic gas ranges, S. B. Rymer, Magic Chef Inc., Cleveland, Tenn.; gas appliance regulators, Charles Stang Jr., Maxitrol Co., Detroit; gas boilers, Gordon L. Cheasley, Richmond Plumbing & Fixtures division, Rheem Manufacturing Co., New Castle, Del.

Gas clothes dryers, Edward A. Nash, Norge Sales Corp., Chicago; gas conversion burners, Joseph F. Capoun, Columbia Burner Co., Toledo, Ohio; gas furnaces, Samuel F. Shawhan, Bryant Manufacturing Co., Indianapolis; gas unit heater and duct furnaces, Clarence E. Scott, Sterlairco Inc., Westfield, Mass.; gas valves, Donald E. DuPerow, Lincoln Brass Works, Detroit; gas vents and chimneys, John H. Schmidt, Van-Packer Co., Carbon Cliff, Ill.; gas wall and floor furnaces, Lee A. Brand, Empire Stove Co.; gas water heaters, Charles J. Callanan Jr., Plumbing & Heating division, American Standard.

Relief valves, Nils W. Swanson, McDonnell & Miller Inc., Chicago; industrial gas equipment, Lowell F. Crouse, Maxon Premix Burner Co., Muncie, Ind.; gas refrigerators, George T. Stevens, Whirlpool Corp., Benton Harbor, Mich.

Continued on page 86

CUT 20" CAST IRON PIPE
in Less Than 8 Minutes...

...with the New REED
ROTARY CUTTERS
(4 sizes cover the range from 10" cast iron to 26" steel pipe)

These one-man Reed Rotary Cutters cut large diameter steel or cast iron pipe *faster and better than the heaviest power machines* . . . and without electrical or explosive hazards. What's more, there's less digging in ditch-work! You need only a 4" to 6" channel under the pipe and a 45° to 60° arc for the handle swing. Reed Rotaries are easy to "carry in", too. The 20" size weighs only 68 pounds; separates into 3 easily carried parts. Patented pipe guide assures clean, right-angle cuts. Four razor blade wheels track perfectly, cut easily and are quickly interchangeable for steel or cast iron pipe.

- Write today for descriptive literature.

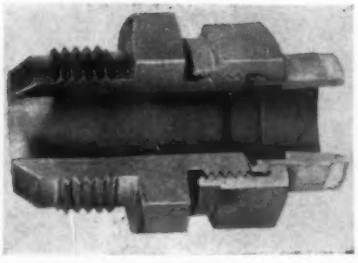
These typical cuts on 12, 16, 20 and 24" cast iron pipe illustrate the clean, accurate, right-angle cuts provided by Reed Rotary Cutters.

REED
REED MANUFACTURING COMPANY
ERIE • PENNSYLVANIA

GAS DIGEST

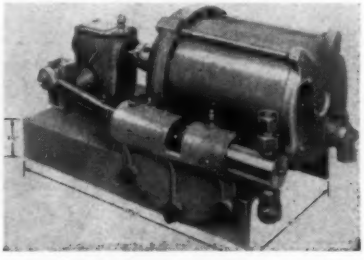
New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 81, 82



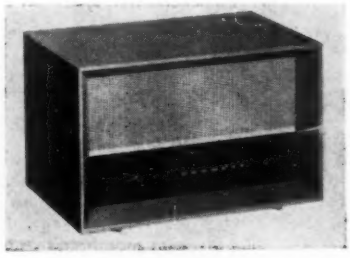
1. Tube coupling

Resistoflex is producing a high temperature, high pressure rigid tube coupling with a superior seal (GEC-370). These leak-proof fittings, known as Dynatube, maintain their seal under conditions of vibration, shock, pressure overloads, pulsing action or temperature variations.
Resistoflex Corp.



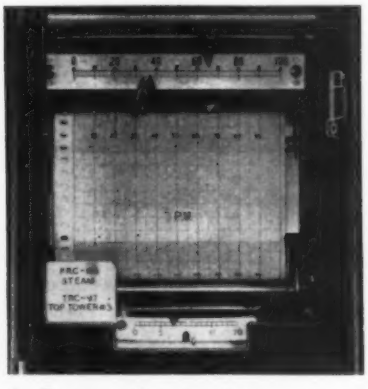
3. Liquid pump

A new "Vari-Flow" pump from Arcco supplies liquid to Arcco anubis liquid gravitometers from lines operating under unusually high pressures where no differential is available (GEC-660). The new pump has been developed to work successfully under extremely high pipeline pressure.
Arcco Instrument Co.



5. Wire-less intercom

Precision Equipment is producing a completely portable intercom called the Bennett (GEC-140). The system provides instantaneous simple two-way communication without wiring; it is just plugged in. Up to eight additional units may be used; all are heard with the same clarity at the same volume.
Precision Equipment Co.

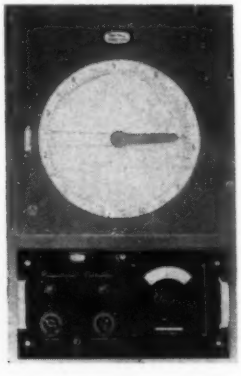


2. Pneumatic receivers

Bristol has a new line of 4-in. chart Metagraphic pneumatic receivers (GEC-750). Built to a completely new design, Series 670 is described as user-oriented, with many new features, both standard and optional. Nine models are available to meet any control requirement.
Bristol Co.

4. Two-way radio

A new 50-watt power output Transicom two-way mobile radio, Type 125-A, for use in the 25-54 mc band is announced by DuMont (GEC-140). Transicom two-way radio equipment is now available in four versions to meet requirements of users in both the 25-54 mc band and the 144-174 mc band.
Allen B. DuMont



6. Proportional controller

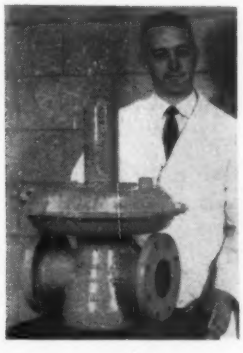
Thermo Electric's new Thermo Electronic proportional controller controls without overshoot and minimizes cycling (GEC-750). Used in conjunction with primary instruments, such as indicators or indicating recorders, the proportional controller provides accurate control of practically any process.
Thermo Electric Co., Inc.

7. Jack-leg ditcher

The jack-leg Ditch Witch comes in 9-hp and 12-hp sizes, mounted on rubber tires (GEC-210). The jack on the trencher wheel may be installed on either side of the machine. With it, one wheel may be lowered as much as 12 in., so that the machine will be on a vertical plane while the wheels are driving on two different levels.
Charles Machine Works Inc.

8. Computer programs

Techniques that make the electronic computer a "management laboratory" for testing decisions in three critical business areas were announced by IBM (GEC-180). Policies affecting project scheduling, inventory management, and capital investment can be evaluated in advance with EDP equipment using the new computer programs.
International Business Machines



9. Pressure regulator

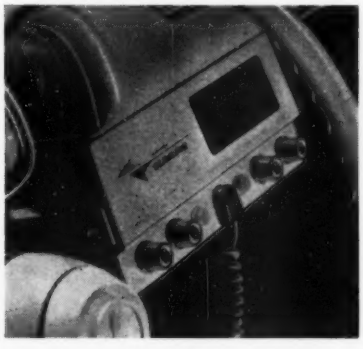
Maxitrol's new 4-in. pipe size gas pressure regulator is designed for rugged industrial low pressure gas service where pressure drop must be held to an absolute minimum (GEC-820). Model MV-130 has a conservative maximum 5 psi operating pressure, with no structure damage at 25 psi emergency exposure.
Maxitrol Co.

10. TV inspection

Inspectoline has a complete television system for the inspection of gas lines, oil lines, wells, etc. (GEC-500). The water-tight system is complete with an enclosed lighting system, 500 or 1100 ft of cable, and generator. It is capable of being pulled through pipelines as small as 4 in. and as large as 48 in. in diameter.
Inspectroline Inc.

11. Transducer

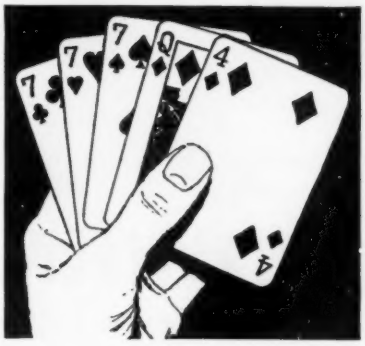
Robertshaw's Aeronautical and Instrument division is producing a new electrical-to-pneumatic transducer which provides both d.c. signal amplification and pneumatic conversion within 0.75 per cent accuracy (GEC-750). Both functions of the Robertshaw-Microsen E-300 are carried out within a single compact water-proof (or explosion-proof) enclosure.
Robertshaw-Fulton



12. Two-way radio

New high-performance, low-cost VHF FM two-way mobile communications equipment is available from Aeronautical Electronics (GEC-140). The new 15-watt mobile radio set in the Slimline series weighs only 8 lb, 10 oz and is less than 5 in. high. It fits easily under the dash of any car or truck, including the new compacts.
Aeronautical Electronics Inc.

POKER? Play to win!



How would you play this hand?

Raise? If your 3-of-kind are nines or lower, yes. Four times in five your hand will be high before the draw, but protect it. If the 3-of-kind are tens or better, don't raise until after the draw. You want customers.

Here's a sure winner from FORD:

Sherman C-8 Bobcat power digger—master of the bell hole.

From one quick-set tractor position, the Bobcat digs clean, straight-sided bell holes faster and cheaper than any other unit on the market. Close-coupled to tractor, excellent for work in close quarters.

The Bobcat's a master of the small hole, too. Digs 5 feet deep with a surface opening as small as 48" in length. Get all the details from your Ford Tractor Dealer, or write:

Tractor and Implement Division
Ford Motor Company
Birmingham, Michigan

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TRACTORS
EQUIPMENT

Quality pays
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TRENCHER

AUBURN
IS BETTER BUILT TO GIVE YOU
MORE PERFORMANCE

You get more trench for your money—day in and day out—and at less cost with an AUBURN. Simple and rugged in design, it's virtually trouble-free. Its variable hydraulic drive automatically adjusts the speed to changing soil conditions. One man operates it digging up to 800' per hour, 6" to 14" wide and down to 6' deep.

Job proven . . . AUBURN is the first choice of contractors, utility and telephone companies throughout the world. It is the most profitable trencher you'll ever own, ask any AUBURN owner . . . he'll recommend it.

Write us for literature and the name of your nearest AUBURN dealer.

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Heat and vibration-proof, non-solvent, will not shrink, crack or crumble. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion and joint seizure.

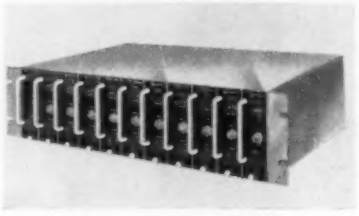
7 BASIC BLENDS

LIQUID WRENCH
LOOSENS
RUSTED BOLTS

A powerful blend of fast-acting solvents that literally "melt the rust away"—safe on all metals and alloys.

RADIATOR SPECIALTY CO.
CHARLOTTE, N. C.

GAS DIGEST



13. Audio tone signalling

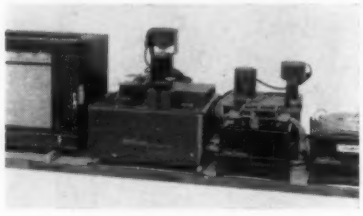
Quindar's new audio tone channels provide a practical method of remote supervisory control and telemetry (GEC-750). Quindar AM (on-off type) and FS (frequency shift) tone units augment the hands and eyes of an operator for centralized dispatching. A single audio transmission circuit is used for multiplexing or combining the audio tone channels for remote operations.
Quindar Electronics

14. Proportioning device

Isotopes has a device which will inject gaseous material into a larger gas system at a constant ratio in the part-per-million range (GEC-465). The automatic and self-contained device requires no power source other than that supplied by mainline pressures. Adjustable injection ratio is maintained regardless of pressure, temperature, or flow variations in the main stream.
Isotopes, Inc.

15. Transceiver

A self-contained transceiver from Westrex makes possible reliable, low-cost and versatile radio communication by unskilled operators from fixed or field stations (GEC-140). The 9B transceiver is a 100-watt (peak envelope power) single sideband transmitter and high-sensitivity receiver designed for use in a wide variety of environments.
Westrex Co.



16. Chemical analysis

A new differential Auto-Analyzer for continuous chemical analysis, with automatic blank or interference compensation, from Technicon Controls can detect trace materials down to parts per billion with an accuracy of 1 per cent (GEC-670). The analyzer automates all steps of a chemical analysis now performed manually and integrates them into a continuous flow system.
Technicon Controls, Inc.

17. Gas filter

A new Eclipse Star-Sixties gas filter is said to completely remove all fine dust and scale from gas as it passes through the filter (GEC-350). It is available for gas pressures up to 125 psig. Maximum drop across filter is 10 psig. The filter is a polyurethane cartridge which can be replaced easily by removing the filter bonnet. The body stays in the line.
Eclipse Fuel Engineering Co.

18. Backhoes

Three completely new Parsons-Shawnee backhoes for utility tractors are announced by Parsons (GEC-210). The new models include the 1000, with a digging capacity of 10 ft deep; the 12-ft 1200; and the 13-ft 1300. With the recently announced 15-ft 1500, Parsons-Shawnee backhoes now cover a complete range of sizes to handle a wide variety of digging jobs.
Parsons Co.

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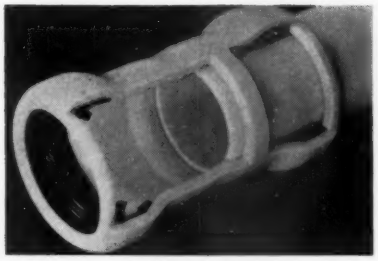
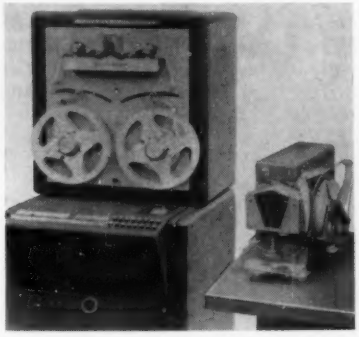


19. PVC coupling

Polyvinyl chloride gas mains can be coupled quickly and without tools with a new hard-PVC connecting sleeve (GEC-630). The coupling can take both high and low pressures without the slightest deteriorating effect. The coupling consists of two U-shaped rib-profiled rubber rings which ensure instant and effective sealing.
Netherlands Trade Commission

20. Gas jingles

A series of radio jingles is being produced by Speedy Therm (GEC-550). The series consists of one "general" jingle relating to natural gas, six "specific" jingles relating to drying, heating, hot water, air conditioning, incineration and cooking, and one musical instrumental. They are timed for 10-, 20- and 60-second spots.
Speedy Therm



21. Data transmission

Digitronics' Dial-O-Verter system, operating in connection with the Bell System's Data-Phone 200 subset, makes possible rapid transmission of punched card, paper tape, or magnetic tape data over regular toll telephone lines (GEC-140). With the system, as many as 27,000 alphanumeric characters can be sent during one three-minute phone call.
Digitronics Corp.

TRADE LITERATURE

22. Gas fittings

Babcock & Wilcox has a new six-page booklet dealing with light wall gas distribution welding fittings manufactured from seamless steel tubing (GEC-620). Bulletin TF-505 contains dimensional charts on light wall pipe, ells, returns, tees, caps, reducers, and slip-on flanges.
Babcock & Wilcox Co.

23. Pipe chart

Midwest Piping has published a 17-in. x 11-in. pipe dimension chart showing outside diameter and wall thickness for all sizes of pipe from ½-in. through 42-in. (GEC-620). Included is information from ASA Standard B36.10, showing IPS and schedule number and their relationship, and includes latest wall thicknesses added in the 1959 revision.
Midwest Piping Div.

24. Line-mounted gas meters

Roots-Connersville has released a new data sheet on line-mounted Rootsmeters (GEC-560). Line-mounted models come in 3000 cfh and 7000 cfh (dial rate) for working pressures to 125 psig.
Roots-Connersville Blower

25. Chart changer

A new illustrated bulletin describes the Mullins Dial-O-Graph automatic chart changer (GEC-750). Dial-O-Graph is a simple attachment that makes a circular chart recording instrument fully automatic in operation, permitting it to run for days or weeks completely unattended, with accuracy, continuity, and dependability assured.
Mullins Manufacturing Co.

26. Gas meters

Arkla's new V-250 gas meter is described in new literature (GEC-560). Complete descriptive information and cutaway photos highlight the bulletin.
Arkla Meters

27. Valves

Ledeen has published Bulletin 5000 covering its line of Spanseal valves (GEC-820). Described are pilot-operated line and control valves and low pressure operated and line pressure operated valves.
Ledeen Inc.

AMERICAN®
VOLUME
AND
PRESSURE
GAGE

The American Volume and Pressure Gage records the time and pressure at which each unit measure of gas passes through a meter. It may be used with regular, Base Pressure or Base Volume Indexes on large positive displacement meters.

Clock or Index-driven models available. The Clock-driven model records the exact time of peak loads and the maximum flow rates. Each unit volume of gas can then be corrected by the pressure factor, providing greater accuracy than a 24-hour averaging method. It will also indicate line breaks, and the gas volume passed during the break when downstream from the meter.

Index-driven model records pressure at which each unit volume of gas passes through the meter for correcting the volume to the base pressure.

See Bulletin 202 for details.

AMERICAN METER COMPANY

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AL-425 ALUMINUMCASE METER

For Small Industrial and Commercial Loads

- Compact and light weight – only 18 lbs.–savings in shipping, handling and setting costs.
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- Rated capacity of 425 cfh at ½-inch w.c. differential with 0.64 sp. gr. gas–10 psi maximum working pressure–1¼-in. MC connections.
- Longest service life at lowest cost per meter per year of service.

See Bulletin 317 for details.

AMERICAN METER COMPANY

Sales Offices in Principal Cities

TRADE LITERATURE

28. Service manuals

Descriptive literature is available on AGA's gas heating controls service manual (GEC-190). The manual combines in one volume service instructions for various makes and models of controls in general use on gas central heating equipment and space heaters.
American Gas Association

29. Venting bulletin

Gas Vent Institute has published its third technical bulletin, this one describing corrosion resistance of gas venting materials (GEC-840). The bulletin describes the corrosion-resistant properties of double-wall gas vents. It is intended to correct any misconceptions that exist on abilities of double-wall gas vents to withstand corrosion.
Gas Vent Institute

30. Gas regulators

Three new information booklets on gas regulators have been issued by Reynolds Gas Regulator Co. (GEC-700). Covered are Reynolds field regulators, the 8010 house service regulator, and the 8310 series house and high pressure service regulator.
Reynolds Gas Regulator Co.

31. Compressor valves

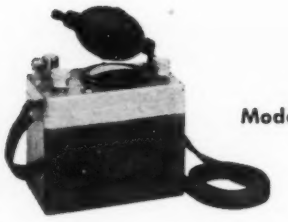
The operation and importance of valves in modern reciprocating compressors are described in a new 44-page booklet from Ingersoll-Rand (GEC-160). "Questions and Answers About Valving" details the demands made on valves and their function in a compressor.
Ingersoll-Rand Co.

32. Front end loaders

The many applications that can be handled by front end loaders are explained in a new booklet from Caterpillar (GEC-210). The eight-page booklet, "Do More Jobs Easier" covers each of the company's three wheel-type and three track-type Traxcavators.
Caterpillar Tractor Co.

33. Temperature transmitter

Honeywell's new 8-page specification S 630-1 outlines features, specifications and ordering information on pneumatic temperature transmitter. The new unit uses a filled thermal system.
Minneapolis-Honeywell



Model G

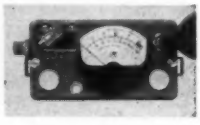
Model H

Testing barhole for gas leakage

Two J-W portable gas detectors give reliable, trouble-free service

J-W SNIFFER, Model G, is used for a general-purpose combustible gas detector. Scale is graduated from 0-1.0 l.e.l. (lower explosive limit) for all common gases and vapors. Light in weight (4 lbs.), simple to use and maintain.

J-W GAS-POINTER, Model H is ideal for testing barholes for underground leaks in natural gas lines. Also used for testing manholes, valve boxes, etc. Two scales: 0-1.0 l.e.l. and 0-100% (pure) gas. Exclusive design eliminates electrical switching or zero shift when changing from one range to the other.



Descriptive literature on request.

J-W **Johnson-Williams, Inc.**
Palo Alto 11, California

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Safety Supply Co., Toronto, Ont.
Fleck Bros. Ltd., Vancouver, B.C.

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TRADE LITERATURE

34. 4-wheel drive loaders

A new catalog on four wheel drive loaders has been released by J. I. Case (GEC-210). The 16-page catalog is designed for easy performance and appliance reference. It lists specifications on each of the three models.
J. I. Case Co.

35. Microwave

General Electric's transistorized RF-7 microwave equipment is described in bulletin ECM-144 (GEC-140). The new design, for voice, data, teletype, facsimile and telegraph transmission, provides increased reliability for medium-to-long haul, multi-channel, point-to-point communication systems.
General Electric

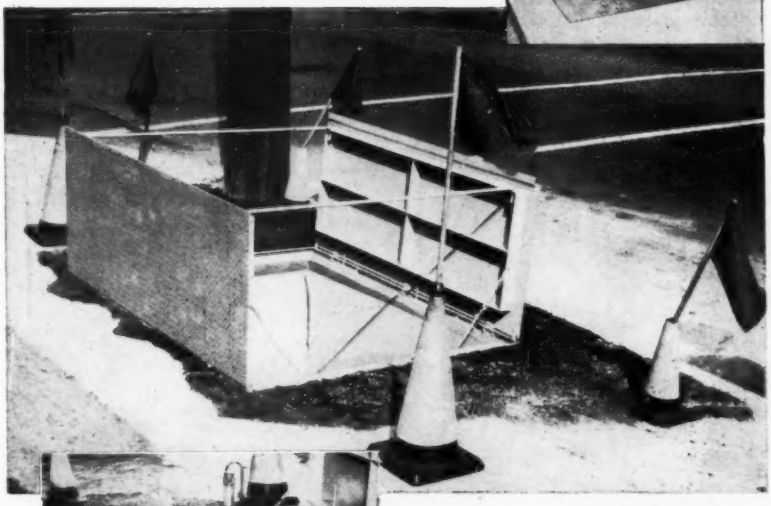
36. Heat load calculations

A simplified method of heating and cooling load calculation whereby such data as glass, shading and latitude factors are combined in easy-to-read tabular form has been developed by Arkla Air Conditioning (GEC-020). Arkla's 94-page "Comfort Guide" is part of a three-element load estimating package which also includes a companion pad of 50 heating and cooling load estimation forms and the Arkla Psychrometric chart.
Arkla Air Conditioning

37. Service bodies

Stahl devotes more than 60 pages to its line of utility service bodies and equipment (GEC-790). The three-ring, binder-type catalog includes photos and full specifications of bodies, derricks, aerial ladders, winches, ladder racks, side boxes and equipment for every utility purpose.
Stahl Metal Products Inc.

easiest access to regulators under-the-sidewalk



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Bilco vault doors are the safe choice for gas regulator vaults underfoot. More and more gas companies are finding that Bilco doors wear better, keep water out. When opened they provide maximum ventilation for service men's safety. Built-in drainage and easy maintenance add up to another Bilco bonus—and every Bilco door swings open easily because it's *spring-balanced!*

Send coupon today for FREE copy of article in Gas Magazine, entitled: "Standardization and Prefabrication of District Regulator Installations."

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associations • *Continued*

from page 77

Fleming heads PUAA

John A. Fleming, director of public relations for Canadian Western Natural Gas Co. Ltd., and Northwestern Utilities Ltd., Calgary, Alberta, heads the Public Utilities Advertising Association for the coming year. Fleming is the first Canadian to hold the post.

Other newly elected 1961-62 officers are James W. Lumpp, advertising and public relations manager, Union Electric Co., St. Louis, 1st vice president; Elton E. Stuenckel, director of marketing, South Jersey Gas Co., Atlantic City, 2nd vice president; and William L. Perdue, director of publicity, Kansas Power & Light Co., Topeka, 3rd vice president.

Donald T. Spangenberg, director of advertising, Public Service Co. of Colorado, Denver, was elected secretary. Re-elected treasurer was Mead Schenck, director of public information for Interstate Power Co., Dubuque, Iowa.

PUAA honors utility advertising

Ninety-four utilities in the U. S. and Canada have won outstanding honors in the field of advertising, according to the Public Utilities Advertising Association.

Gas companies that won five awards each are Northern States Power Co. and Pacific Gas & Electric Co.

Firms winning four awards each are: Gulf States Utilities Co., Quebec Power Co., and South Jersey Gas Co.

Among the companies winning three awards each: Consumers Power Co., Milwaukee Gas Light Co., Minneapolis Gas Co., Narragansett Electric Co., Ohio Fuel Gas Co., Peoples Gas Light & Coke Co., Savannah Gas Co., Union Electric Co., Wisconsin Public Service Corp., and Wisconsin Gas Co.

Canadians re-elect Ostler president

Some 400 people attended the second annual meeting of the Gas and Petroleum Association of Ontario, Canada.

J. W. Ostler, Canadian Meter Co. Ltd., Milton, Ont., was elected to serve a second term as president. Serving with him are F. R. Palin (Union Gas Co. of Canada Ltd., Chatham), re-elected 1st vice president, and E. S. Howard (Provincial Gas Co. Ltd., Fort Erie), re-elected 2nd vice president. A. M. Hove (Northern Ontario Natural Gas Co. Ltd., Toronto), was elected treasurer.

President Ostler reported that arrangements are being made to affiliate the Gas & Petroleum Association with the Canadian Gas Association.

Dallas is site of safety conference

Dallas is the scene of the 13th annual accident prevention conference, co-sponsored this year by AGA and the Southern Gas Association. Dates are Sept. 12-13. Lone Star Gas Co. and Southern Union Gas Co. will serve as co-hosts.

"How to do it" demonstrations of safety meetings using audio-visual aids will highlight the session.

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GAS PROPERTIES IN THE U. S. AND CANADA

ANDERSON TEST PLUGS

— *fast pressure-tester for 1½" lines and smaller*

A quick, economical way for stand-up pressure testing of lead-in lines and testing of tubing in heat exchangers and boilers. Safe! Release is impossible until pressure is exhausted. Fast! Cam movement instantly plugs and unplugs. Proved time-saver by 6 years' field usage.

FREE LITERATURE

ANDERSON & GRUNSKY
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Manufacturers of time-saving Anderson Test Plugs and Pipe and Tubing Pullers

regulatory • *Continued*

from page 12

type of agency proceeding; and containing an absolute prohibition against ex parte contact in all proceedings between private parties in which law or agency regulation requires that a decision be made solely on the record of a formal hearing. Only in this manner can we assure fairness in quasi-judicial proceedings between private parties. The statute should make clear that such codes when approved by Congress will have the force of law, and be subject to appropriate sanctions."

• Executive orders

There are several problems of ethics in Government that the President will solve by Executive Orders.

The President will prohibit gifts to Government personnel whenever (a) the employee has reason to believe that the gift was made because of his official position; or (b) when a regular Government employee has reason to believe that the donor's private interests will be affected by actions of the employee or his agency. When it is impossible or inappropriate to refuse the gift it will be passed to an appropriate public or charitable institution. The order will embody the principle that any gift which is designed to influence official conduct is objectionable. Government employees are bothered by favors or gratuities and have been without any general regulation to guide them.

He will prohibit Government employees from using for private gain official information that is not available to the public. A Government employee should not be able to transform official information into private gain.

The President will direct that no Government employee shall use the authority of his position to induce a person to provide him with anything of economic value whenever the employee has reason to believe that private interests may be affected by the employee or his agency. This regulation is an effort to deal with the subtler forms of extortion; where an employee acquiesces in the gift of an economic benefit. The criminal law deals with outright extortion. Beyond this the problem is too elusive for the criminal law and must be dealt with by administrative regulation.

He will direct that no Government employee should engage in outside employment which is "incompatible" with his Government employment. The outside work of Government employees is one of the most difficult of all ethical problems. It is clear that some forms of employment may have benefits to the Government or society like teaching in universities, or be beneficial to the employee and not inconsistent with Government work.

He will issue an Executive Order regulating in detail the conduct of those officials who are appointed by the President. These high-level officials owe a special responsibility to the Government and to the employees of their departments to set a high standard of ethical and moral behavior. The Executive Order (a) will prohibit outside employment or activity incompatible with the proper discharge of official

A BELL RINGER FOR SAVINGS!

BELL CRANK ASSEMBLY includes hex aluminum slide, bell crank of rust-resistant cold-rolled steel.

We swapped a bell crank assembly for the famous Reynolds toggle assembly in our Series 8010 House Service Regulator . . . And created the NR*B* 8010 as a companion to the toggle type, the NR*T*. For real economy, the new NRB 8010 rings the bell! . . . You can't beat the *performance* of either model of the reliable Reynolds 8010!

We'll be most happy to send you complete information, take your order, and ship you a carton or a carload!

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ARKLA **REYNOLDS GAS REGULATOR CO., INC., ANDERSON, INDIANA**

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responsibility; (b) will prohibit outside compensation for any activity within the scope of official duty; (c) will prohibit the receipt of compensation for any lecture, article, or public appearance, devoted to the work of the department or based on official information not a matter of general knowledge.

In carrying out the provisions of law, he will apply Governmentwide standards to the continuance of property holdings by appointees to the executive branch. The law prohibits any conflict of the public and private interests of employees of the Government. The Senate, in confirmation, has required that Presidential appointees sell their property in cases where retention might result in a conflict of interest.

• The outlook

The rapid rate of turnover among career Government employees has been as high as 20 per cent a year. The result is an acute multiplication of the risk of conflicts of interest. Concurrently the problem of maintaining ethical standards has been complicated. The future contains more ethical conduct in Government with the help of new guides, rules and the fear of punishment. ■

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ARCCO-ANUBIS
'Dry-Air GAS
GRAVITOMETERS
This new Arcco-Anubis Dry Air Gas Gravitometer determines and records specific gravity of gases automatically corrected to the humidity content of the air. The difference in weight between a column of GAS and equal column of DRY AIR is measured. This ratio represents the true specific gravity of the sample.
One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101 R-4.
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INSTRUMENT COMPANY, INC.
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MANUFACTURERS OF PRECISION INSTRUMENTS

Washington • *Cont'd.*

from page 17

and there are a score more introduced in both houses by various other lawmakers.

Once again, surrounding the battle in which the gas industry is again in the middle, is a controversy over political boon doggling. There's a sort of poetic ring to the latest bit of ineptness involving the industry—a solicitation by an overeager friend of President Kennedy's new Interior Secretary to the industry to buy tickets to $100-a-plate Democratic party fund-raising dinner. Secretary Udall later disclaimed the zealousness of his fund-raising friend, oilman J. K. Evans, but the similarity to a previous blunder by Republicans was clear.

Neither situation was important, except that they again put the industry in an embarrassing light.

Meanwhile, President Kennedy is running into not-unexpected opposition to his ambitious plans to overhaul the regulatory agencies, of which the FPC is one. The early fights centered on the Federal Communications Commission and a Kennedy reorganization plan to sharply strengthen the power of its chairman. Congressmen from both parties rose up to denounce the plan as an attempt by the White House to take control of the agency, although all of them have traditionally been under direct control of Congress and independent of the White House, at least on paper.

The agency reorganizations are being handled by executive order under a new law. This law gives the President power to reorganize almost at will any agency of government, subject only to congressional veto. But it looked as though Congress was going to turn down his first reorganization efforts as too severe.

This may be a good indication of what will eventually be in store for the FPC, although of all the agencies, the power commission is the most criticized and operates under the most complicated legal authority.

It is probable that the White House will save for last this most controversial and most difficult reorganization task. But it will come. And the gas industry had better prepare now to slug it out with its opponents to make certain that the reorganization clears up the problems, rather than cloud them further.

Cases settled, fog remains

WHILE the battles over natural gas legislation and the future of the Federal Power Commission rage, the courts and the FPC itself continue to whack away at current problems. But the effect is not to clear away much of the fog surrounding natural gas regulation.

In some recent actions, for instance, the U. S. Supreme Court refused to review a lower court decision which permits regulated natural gas firms to retain the benefits of accelerated depreciation and pass along savings to consumers ("phantom taxes" industry critics call them), but agreed to decide whether a city license tax can be levied on a distributor of natural gas shipped across state lines. The distributor sales tax issue arose when the city of Mobile attempted to impose a use tax on gas shipped into the area by United Gas Pipe Line. A decision will come next fall.

Meanwhile, the U. S. Court of Appeals has turned down a bid by the State of Wisconsin to upset the FPC's area pricing policy. The court said it did not have jurisdiction. The State complained that the policy would drive prices up. The court said it could rule only on specific rate cases and the FPC orders, not general policy statements.

The FPC has approved a hearing examiner's recommendation that the FPC refuse to permit a pipeline to bypass a local distributor in an industrial sale.

The decision denies Southern Natural Gas Co. permission to pro-

from American Systems Incorporated...

AN AUTOMATIC RECORDING GAS TITRATOR

Austin Recording Gas Titrator Model 4010

The fully automatic Austin Gas Titrator 4010 is designed for continuous on-line measurement of sulfur in natural gas and plant process streams. Developed for corrosion and odorant control analysis in transmission and distribution systems, the 4010 continuously records on a strip chart its analysis of sulfur compounds. This accurate, reliable analytical instrument is adaptable to virtually any installation in the natural gas, LP gas, petrochemical, and chemical processing industries.

ANALYSIS CYCLE:
Complete analysis and recording of major sulfur constituents once each hour

RANGE (H_2S):
0 to 0.5, 0 to 2.5 grains/100 SCF Full Scale

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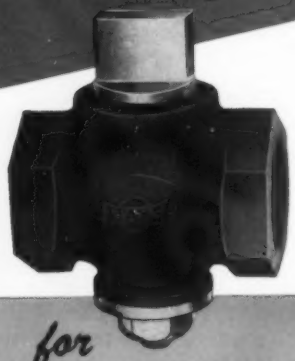
Gas Stops



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vide direct interruptible service to two Savannah, Ga., industrial firms. The sales will be made by the local distributor, and Southern Natural was authorized to build additional facilities to supply the gas.

"In principle, lines of interstate transmission companies should not be laid down on top of local distribution lines for the service of profitable industrial load that can be served by the local distributor," the examiner said. He also said that an agreement in the contract between the pipeline and the distributor dividing the industrial service area is "invalid and ineffectual." The FPC determines who serves the industries in a given area, not the firms involved, he added.

The commission noted that the decision does not necessarily bar any industrial sales by pipelines, but that it will decide such cases "on their merits" individually.

At the same time, it is becoming increasingly clear that it may be years before the FPC finally decides what type of cost data gas producers will have to supply in area-price hearings—if the area-pricing system is maintained.

Hearings on the area-pricing system to date have not produced any progress in resolving this basic conflict in the new system. New hearings on the Permian basin will concentrate on general economic information, with no cost arguments coming much before next winter.

Thus, the area-pricing approach won't be applied for a long time—if ever. ■

corrosion • *Continued*

from page 19

considerable distance—and this can include mining machinery far underground. In a sense, it must be considered to include the offices in which decisions may be made which will affect its actual physical environment; things read about on the financial pages of the newspaper may be quite pertinent to the corrosion engineer's daily work. Almost anything you see, then, may be relevant to the job; so look at what you see, and see what you look at! ■

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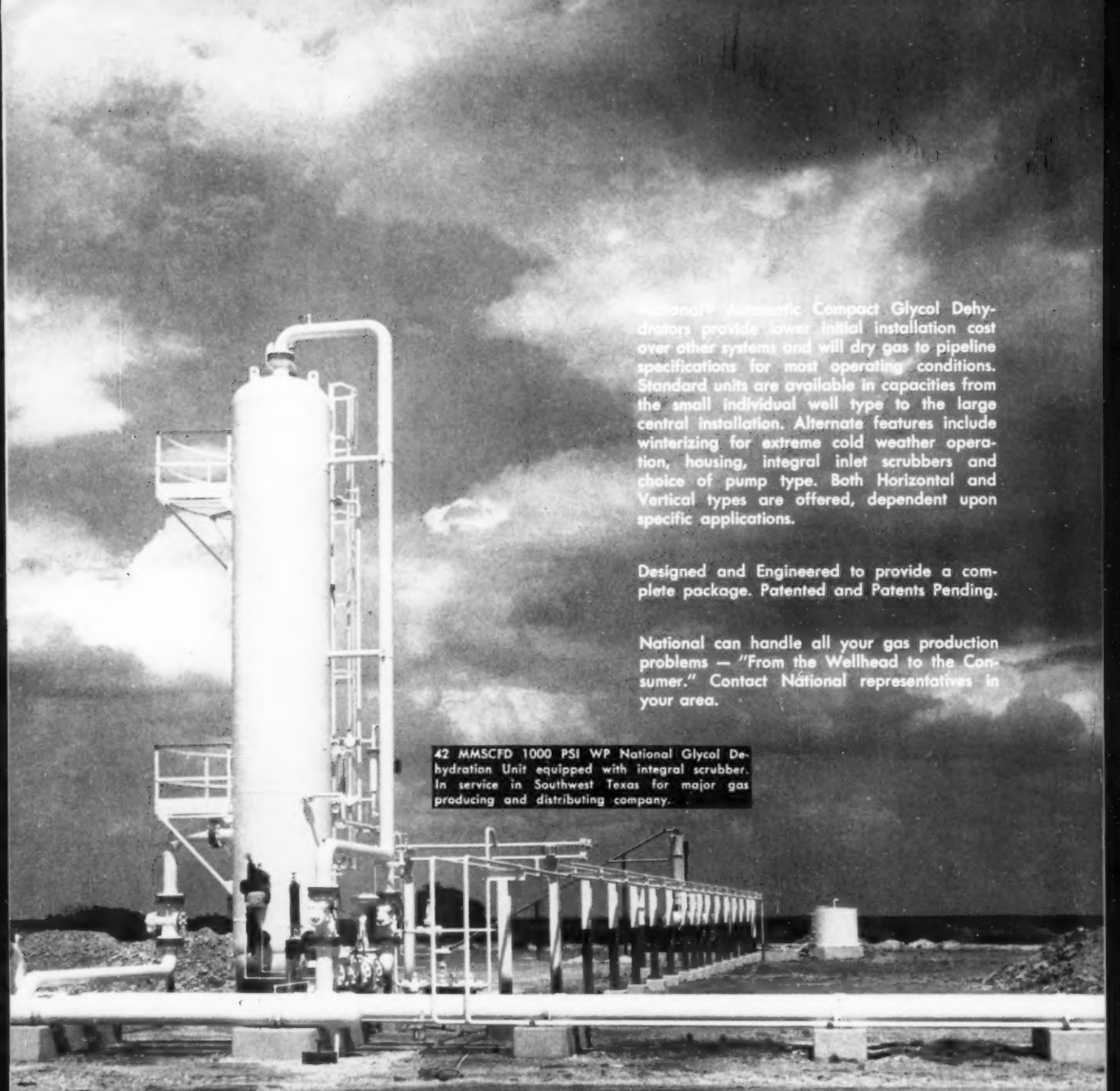
GAS

PIPELINE SECTION

Remote control at McArthur



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REMOTE CONTROL

of McArthur compressor station

By ROBERT LISHKA, Automation Engineer
Ohio Fuel Gas Co., Columbus, Ohio

D. H. WHISTON, Control Engineer
Cooper-Bessemer Corp., Mt. Vernon, Ohio

OHIO Fuel Gas Co.'s McArthur compressor station is one of 33 compressor stations operated by Ohio Fuel to speed deliveries of natural gas to almost 797,500 retail customers in 515 communities in 56 Ohio counties.

Located in Vinton county, about 75 miles southeast of Columbus, the station's function is to store large volumes of natural gas that are delivered to Ohio through huge, long-distance pipelines from the Southwest in summer, and release the gas in winter to augment available pipeline capacities and aid in maintaining high load factor deliveries from Southwest sources.

While most of Ohio Fuel's 10 storage stations are located near major market areas and can pick up the hourly load variations in both summer and winter, McArthur station is on the main central pipeline system, remote from major markets. Due to its location and type of operation, McArthur was conceived as being operative by remote control from Crawford station, 35 miles to the north, with a manual change from "storage in" to "storage out" in the spring and fall.

McArthur is equipped with three 1100-hp Cooper-Bessemer GMVA-8 engines, each of which has four directly connected 11½-in. diameter Class CB 8-14 compressor cylinders. (See *Fig. 1.*) Gas for storage is taken from main high pressure lines at approximately 500 psig and compressed to 1000 psig. Gas in or out of storage initially bypasses the compressors and is regulated by remote set point control of a 20-in. plug valve regulator. This continues as long as the field pressure is sufficient to deliver the required volume against the existing line pressure in the case of output. When the field pressure drops below this point, the compressors are remotely started as required to maintain the desired output rate. When the line pressure drops below the field pressure on input, the compressors are remotely started to maintain the desired input rate. The flow computer is continuously telemetering the fully corrected flow rate to assist the dispatcher in these operations. The flow rate curve is automatically integrated and a digital totalized read out in Mcf is available on the control panel.

GAS FLOW MEASUREMENT

Two 10 in. runs, #1 and #3, are used to draw gas out of storage (see *Fig. 2*). Eight-inch run #2 is used to feed gas into storage. The flow functions into and out of storage are seasonal; therefore, the direction of flow is manually changed. The metric differential limit control in run #1 is used to throw open the plug valve in run #3 when the differential exceeds approximately 80 per cent of chart range or 160-in H_2O in run #1. The differential transducer is in the first run and the output flow is computed on this run. The two output runs always have the same size orifice plates and are balanced; therefore, the switch on the second run automatic valve introduces in the computer a x2 multiplier. The flow constant is inserted into the flow computer by means of a manual set potentiometer for any orifice plate size. The specific gravity factor is also manually inserted. The supercompressibility and temperature are automatically compensated for in the computer. The end results are a totally corrected flow rate recording in Mcf/per hr and a digital readout of the totalized flow in Mcf at the control console.

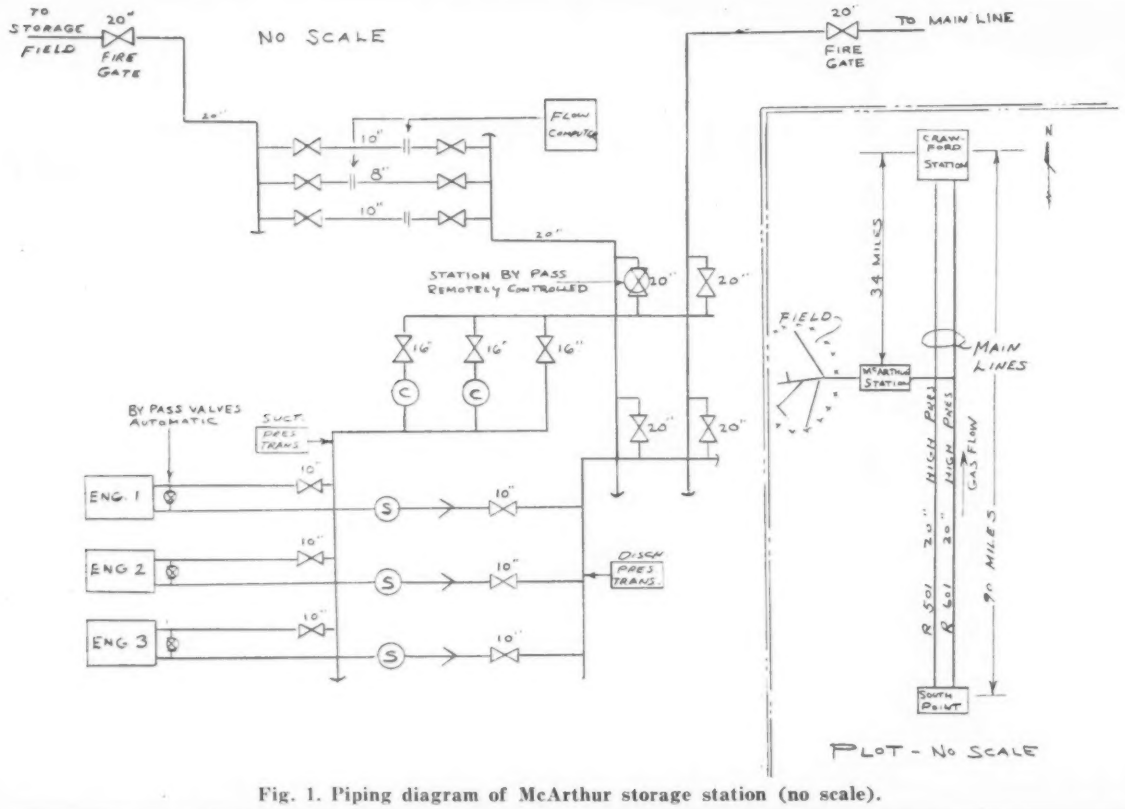


Fig. 1. Piping diagram of McArthur storage station (no scale).

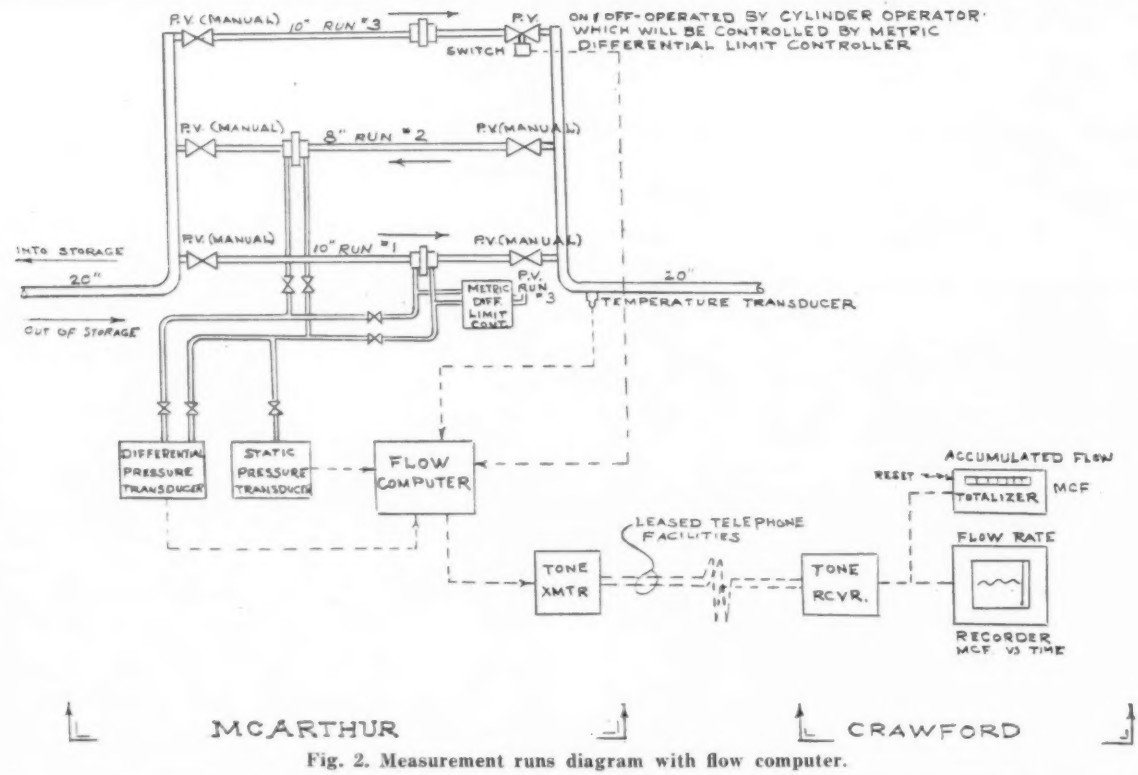


Fig. 2. Measurement runs diagram with flow computer.

The totalizer is equipped with a reset button so that the dispatcher may keep track of throughput for any desirable time interval.

SUPERVISORY CONTROL & TELEMETERING

The three speeds, the suction pressure, discharge pressure and flow are on individual tone frequencies.

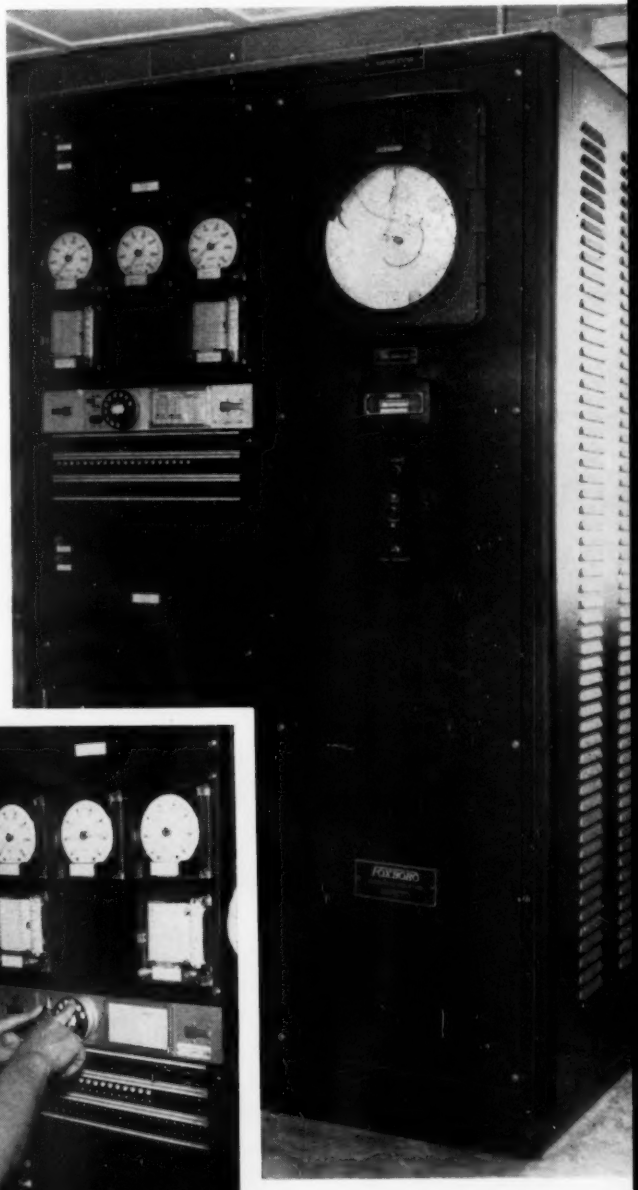
The control portion of the supervisory panels operates as follows (see *Fig. 3*):

The dial control panel provides control for dialing remote functions over a remote control dial system. The dial assembly transmits pulses at a speed of 10 to 14 pps. which keys the 780 cycle tone transmitter at 10 to 14 pps. A dial key is also provided on the dial control panel and the dial assembly can transmit pulses only when the dial key is depressed. A two-digit pulse train is used for controls.

At the remote location the tone receiver picks up the pulses and follows the pulses with its relay. This relay actuates the step switch panel which is a decoding and circuit selecting panel. The panel stepping switch selects one particular circuit from a group of circuits in accordance with the combination of digits received. A momentary ground of about 120 milliseconds duration is then applied to the external equipment connected to the corresponding terminal of the panel terminal strip. The dc voltage through the solenoids to corresponding grounds starts or stops the engines, and raises or lowers pressures, depending on the dial code which was transmitted. The dial control panel at the controlled end is for dial operation from that end when necessary.

The alarm indication portion of the supervisory control panels operates as follows:

The alarm sender panel accepts fault indications in the form of ground or no ground pulses. The alarm sender panel is comprised of two sections, a supervisory section and a scanning section. The supervisory section serves to monitor five alarm circuits and stores the ground and lack of ground in relays which make this information available to the level contacts of a rotary stepping switch. A change in an alarm signal from a supervised circuit conveys this information to the level contacts and also sends a ground to the scanning section which relays the ground to the alarm center through the start lead and tone signal transmitter. This start signal is received at the alarm receiving panel which then sends scanning pulses which verify the monitored functions at the remote location. The rotary stepping switches in the alarm sender and alarm receiving panels are synchronized and the rotary stepping switch at the alarm receiving panel picks up the corresponding ground-no ground from the level contacts through the supervisory relays in the supervisory section of the alarm sender panel.



Far right: Supervisory control master on the left, flow computer receiver on right. Inset: Engineer dialing engine No. 2 down.

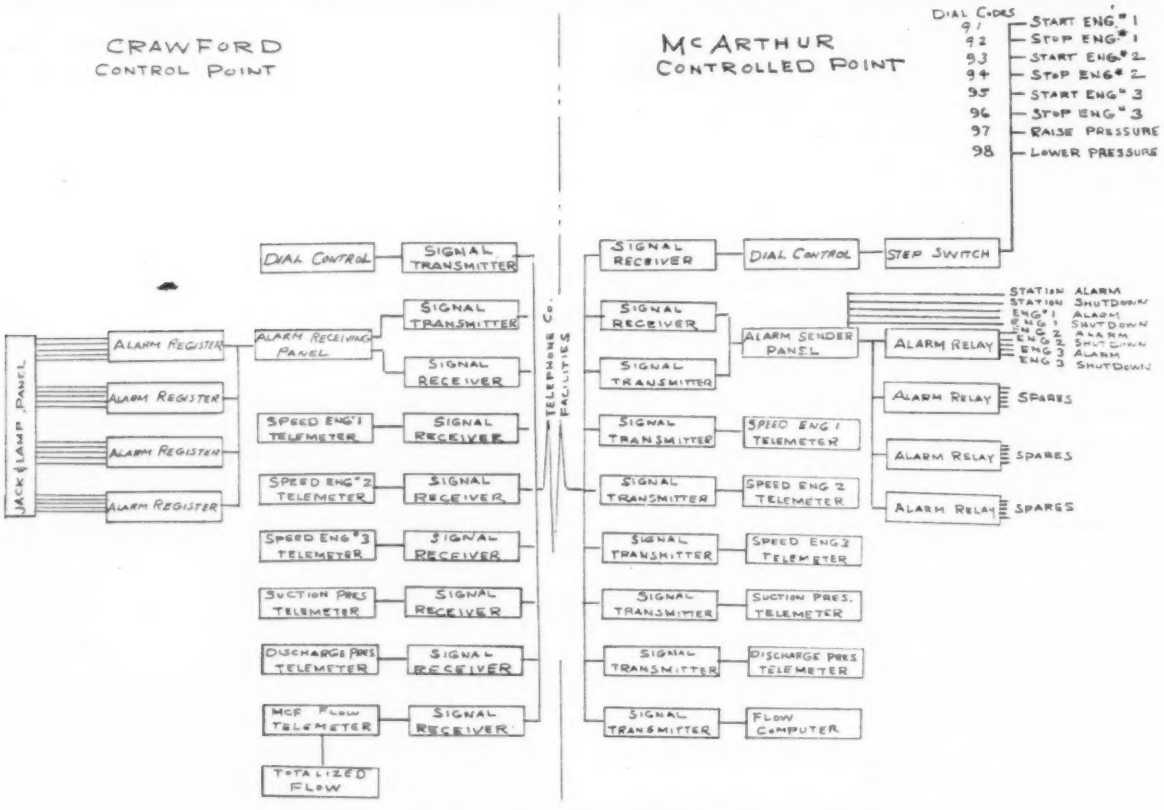
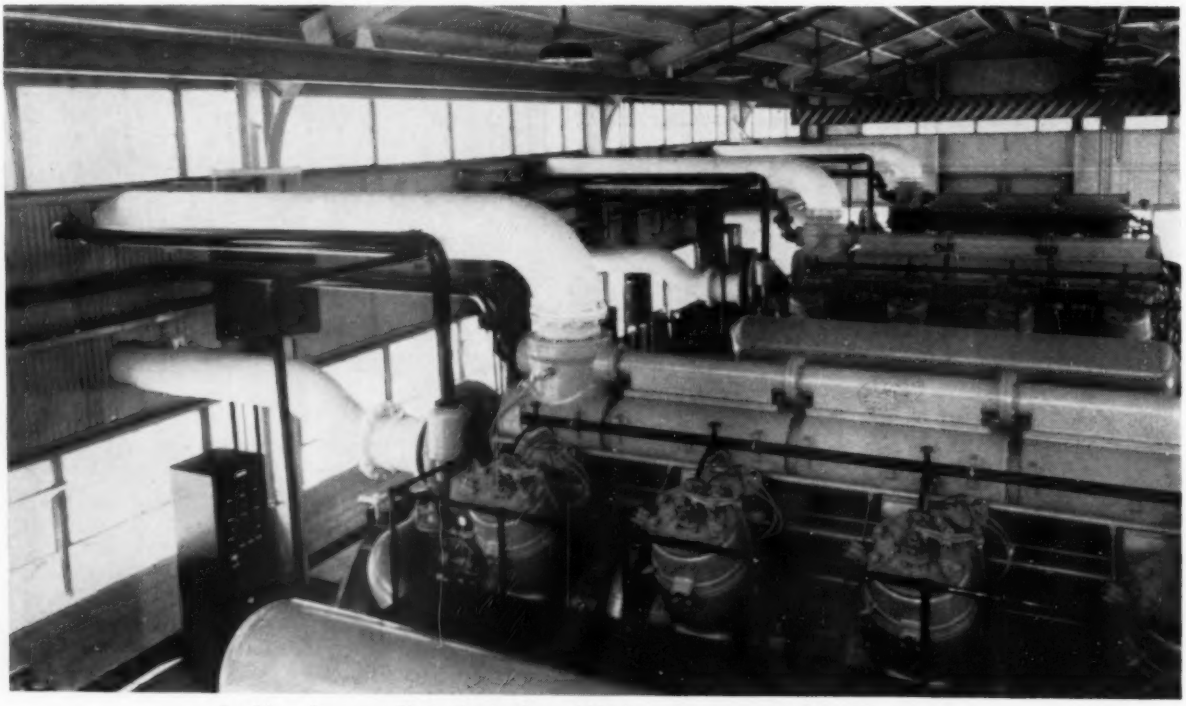
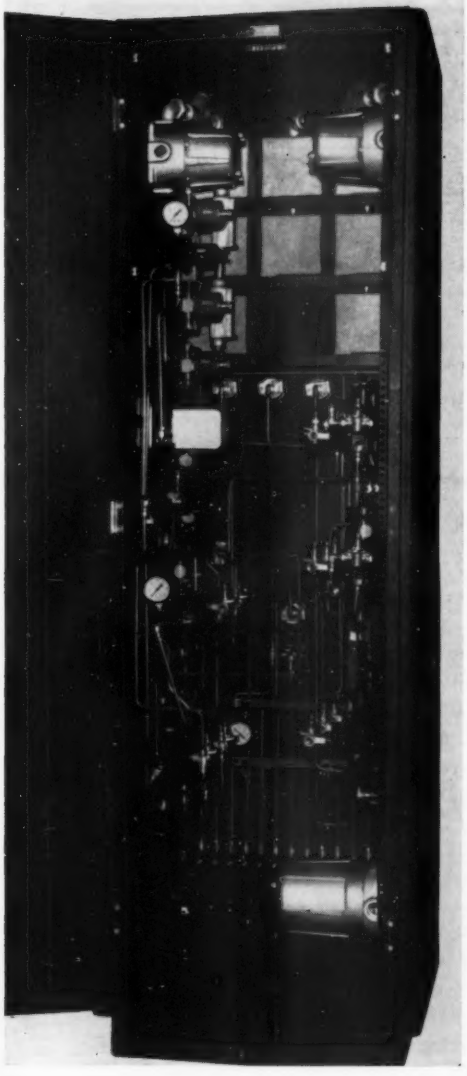
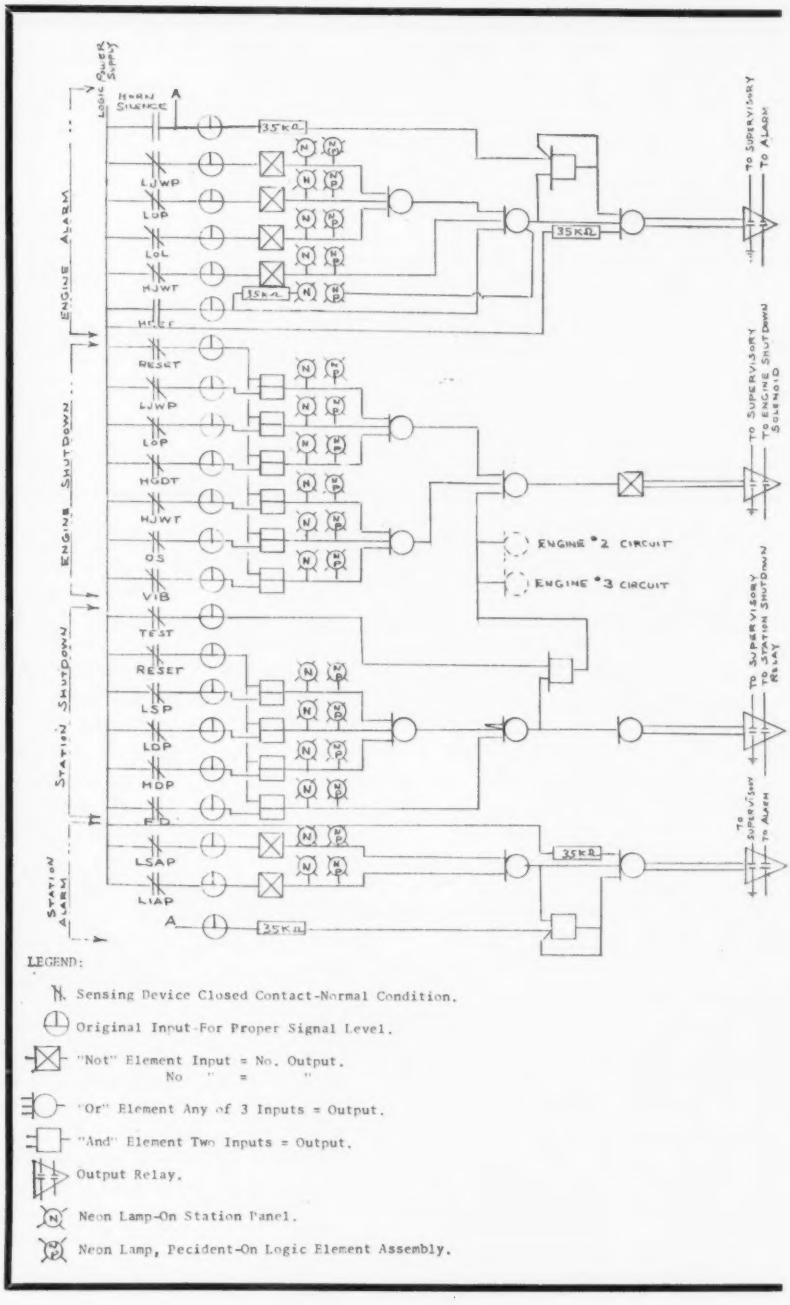


Fig. 3. McArthur controlled point and Crawford control point.



Looking down on McArthur's three 1100-hp compressor engines. One engine automatic starting and sequencing cabinet can be seen in left foreground.





Above: Automatic starting and sequencing cabinet. Fig. 4 (right). Alarm and shutdown control circuit (shown for engine No. 1).

This information is transferred from the alarm receiving panel level contacts of the rotary stepping switch to the alarm register panel. The alarm register panel through relays registers and transmits "A" and "B" indications to the jack and lamp panel. The "A" indication is a white lamp for normal conditions and the "B" indication is a red lamp for an alarm or shutdown condition.

Scans may be initiated manually from the control center. The rotary stepping switch in the alarm receiving panel is arranged to check the synchronization between itself and the rotary stepping switch in the alarm sender panel. Should the step switches fail to synchronize, the panel will actuate an associated SYNC lamp and a new scan should be initiated. Alarm condition changes will be indicated by a flashing indicating lamp for the supervised point and a red system lamp. The condition is acknowledged and returned to normal by manual operation of the RLS and the ACO keys on the jack panel.

ALARM AND SHUTDOWN CONTROL

The alarm and shutdown devices for each of the three engines and the station are tied into a unique logic element arrangement which utilizes solid state

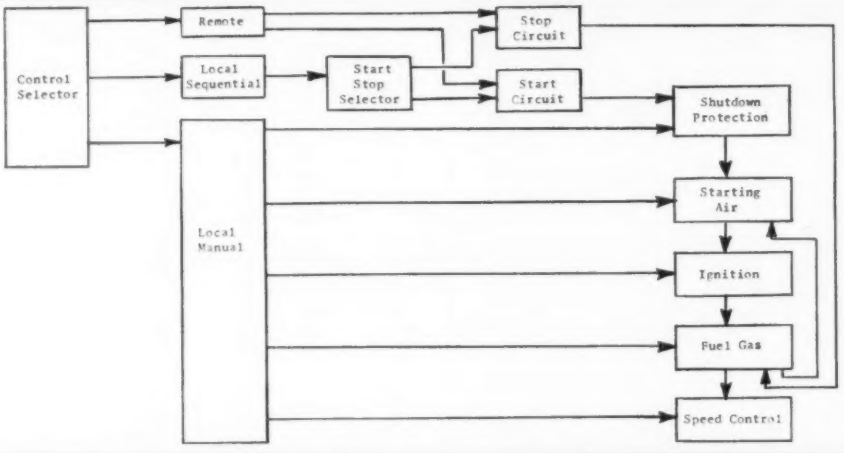


Fig. 5. Block diagram of remote controlled sequence starting system.

static switching. From the diagram (*Fig. 4*) it can be seen that low jacket water pressure (LJWP), low oil pressure (LOP), low oil level (LOL), high jacket water temperature (HJWT) or high cylinder exhaust temperature (HCET) will actuate the alarm relay. This is accomplished through the normally closed contacts of LJWP, LOP, LOL, and HJWT. Since there are signal inputs to the "Not" elements, there can be no outputs. Consequently no neon lights will be on and there will be no inputs to the *"Or"* elements. A fault condition opens the sensing contacts resulting in a *"Not"* element signal output. This causes each successive *"Or"* element to have an output finalized in the operation of the alarm relay.

In the case of the HCET the contact is normally open and the *Not* element is omitted. The signal is fed directly into the *Or* element when a fault occurs. HCET is set up this way due to the pyrometers having normally open contacts to permit the reading of the actual temperatures up to the set point. To silence this alarm it is necessary to actuate the horn silence button at the station. This places Number two input to the Two input *"And"* element, the first input having come from the second *"Or"* element. The output from this *"And"* is fed into the final *"Or"* in a cancelling configuration, resulting in the de-energization of the output relay. Part of the output signal if fed back into Number to input of the *"And"* element which seals the *"And"* in, thereby permits release of the horn silence button. The *"And"* is reset when the fault condition is corrected.

The neon lamps are in the station panel and are lighted independently when alarm faults or shutdown faults occur. The neon precident lamps located adjacent to the logic elements shows which fault occurred first.

The conditions necessary for shutdown are low jacket water pressure (LJWP), low oil pressure (LOP), high gas discharge temperature (GHDT), high jacket water temperature (HJWT) overspeed (OS) and vibration (VIB). The contacts on these sensing devices are normally closed and serve as an input to the off side of a permanent *"Memory"* element, resulting in no output to the next *"Or"* element and subsequently no input or output for the *"Or"* element preceding the *"Not"* element. Since the *not* element has no input it does provide an output and the shutdown relay remains energized.

The shutdown relay in normal operating condition is energized and through its contacts provide power for the shutdown solenoid which must be energized for normal operation. The *"Memory"* element permits the engine to have an emergency shutdown but will not allow it to be started until a manual reset drops the *on* signal and the corrected fault sensing devices applies the *off* signal. When a fault occurs the sensing contact opens and drops the signal input to the *off* section of the *"Memory."* In the absence of the *off* signal the *on* signal causes the *"Memory"* to have an output and subsequently the outputs of the next two *"Or"* elements result in an input to the *"Not"* element. The *"Not"* element will now give no input to the *"output relay"* and the de-energized relay's open contacts will de-energize the engine shutdown solenoid and shut the engine down.

Station alarm and station shutdown are similar in operation with the exception that by the use of a two input *"And,"* the station shutdown also shuts down all three engines. The *"And"* is one of the three inputs to the last *"Or"* element in the engine shutdown circuit.

There are features of this logic control system which for simplification were eliminated from the circuit diagram. All static circuitry and neon lights can be tested by the operation of test switches. There is one test switch for each engine and one for the station. Normally the test switch is in the run position. The other two positions are test and reset. By selecting the test position, a stepping switch goes through all the alarm and shutdown circuitry, and lights all the neon lights in sequence. If all circuits are operating correctly a final green "okay" light is energized.

The power input to the logic panel comes from a 120-v dc battery bank. Failure of local or emergency power would not interrupt compressor engine operation. The logic panel is equipped with its own power supply which reshapes the 120 dc to suit its needs.

AUTOMATIC STARTING AND SEQUENCING CABINET

Each engine has its own set of starting and sequencing controls. This circuit is fully pneumatic and utilizes electrical devices only as the connecting link with the supervision and monitoring cabinet. Solenoid valves are used to start and stop engine and for emergency shutdown. *Fig. 5* is a block diagram of the remote controlled, sequence starting system.

Upon receipt of a start signal, starting air is admitted to the engine. After the engine has turned on air long enough to purge the system, the ignition is turned on. Following the ignition, fuel gas is admitted to the engine in the right amount to permit the engine to run at idle speed and no load. As the engine fires and runs on fuel gas, the starting air is shut off and full load-full speed fuel supply is made available.

Provisions are included in the circuit to limit the cranking time to prevent wasting the supply of starting air in the event the engine does not start. Interlocks are employed so the starting circuit will not operate if the line valves are not in their proper position. Should the engine receive the starting air signal but not turn, the remainder of the circuit will not allow gas to be applied to the engine.

After the engine is running and able to carry load, the speed is increased and the bypass valve is closed, putting the engine on the line. Indicators on the front of the cabinet show the condition of valves at all times. Indicators also show progress through the starting circuit. The cylinder exhaust temperature pyrometers are mounted on the front of the cabinet.

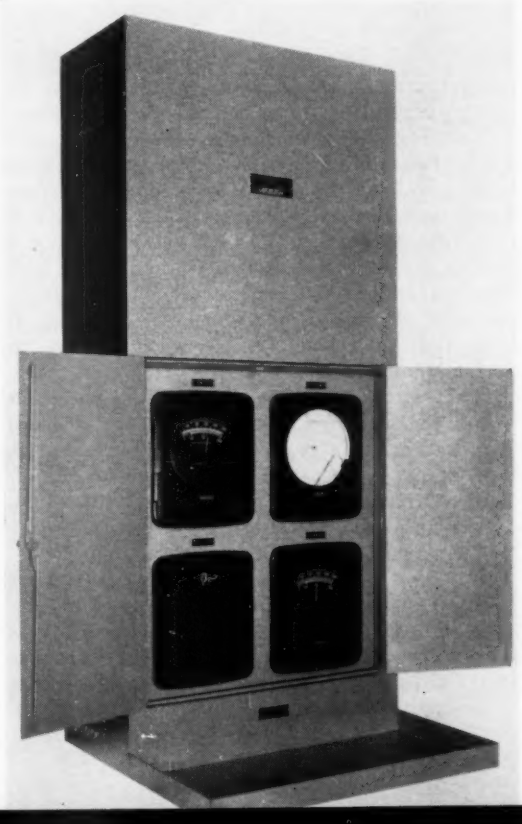
A normal shutdown is essentially the reverse of the starting sequence. The bypass valve is opened, permitting the engine to go to a minimum load and taking it off the line. After a short delay in which the engine returns to its idle condition and cools off briefly, the fuel gas is shut off. The ignition is maintained until after the engine stops, permitting all the fuel going to the engine to be burned. When all the phases of shutdown are completed, the circuit readies itself for the next start.

An emergency signal immediately cuts off the fuel gas stopping the engine. Under these conditions the starting circuit and the monitoring circuit are both locked out and need to be reset.

One of the unique features of this control system is the means of controlling engine speed. A speed transmitter is used to detect the speed of the engine and send a pneumatic signal to a receiving pressure controller. The output of the controller goes to a diaphragm valve regulating the flow of fuel gas to the engine. The pneumatic set point of this controller comes from the output of the station discharge controller and varies the speed of the engine to hold the discharge pressure within the proper limits. ■

Alarm and shutdown control cabinet (left), supervisory control cabinet on the right. Engineer is dialing an engine control from the auxiliary building located 50 ft from compressor building.

Twenty-five feet from McArthur compressor building is the flow computer, housed in a weatherproof cabinet.



PLGS goes under

THERE is probably one feature common to all buried river crossings—the certainty that each one will have its own peculiarities unlike any previous installation. Crossing the lower Colorado river presents a simpler construction problem than may be encountered on many rivers of comparable size, chiefly because it is well controlled. However, in desert country it must be borne in mind that flash floods can radically change the degree of this control. Thus, while it is probable that construction work will present fewer uncertainties, the design of the pipeline crossing of the lower Colorado must take into account all of the infrequent conditions related to weather.

I will not attempt here to describe the multitude of factors that must be considered when a buried pipeline river crossing is designed. That information has been adequately covered earlier. Instead, the effort here will be to show why, in a given situation, a buried crossing was installed in preference to an overhead structure, and how the work was done.

A jointly-owned, dual 24-in. pipeline, put in service in August 1960, across the Colorado river at a point about six miles north of Needles, Calif., is part of a project designed to deliver a major supply of gas to southern California. Transwestern Pipeline Co. owns the Arizona portion, and a 30-in. pipeline east to Rosewell, N. M., and laterals to fields in southern Texas. Pacific Lighting Gas Supply Co. owns the part of the crossing located in California and a 34-in. pipeline which connects to a 30-in. line serving the Los Angeles area. Installation of the crossing was under a single contract awarded to Missouri Valley Dredging Co., Omaha.

Prior to installation of this crossing, all major natural gas pipelines crossed the lower Colorado supported on an overhead structure. However, for a number of reasons it became apparent that consideration should be given to installing the new crossing under the river channel.

Based on the preliminary pipeline route selection, the river crossing was to be at Topock, in the vicinity of three existing natural gas pipeline crossings. All of these deliver gas from El Paso Natural Gas Co. through two 30-in. pipelines to Pacific Gas & Electric Co., and a single 30-in. pipeline to jointly owned facilities of Southern California and Southern Counties Gas companies. Existing lines are carried on separate structures, each approximately 1000 ft long. One is installed on a highway bridge no longer used for vehicles, and two on suspension bridges—one having two

By M. E. FULLER, Chief Engineer
Pacific Lighting Gas Supply Co.,
Los Angeles

Left to right: Existing overhead crossings at Topock. Site of buried crossing (looking upstream). Crossing site after job completed (Arizona in foreground).

the Colorado river

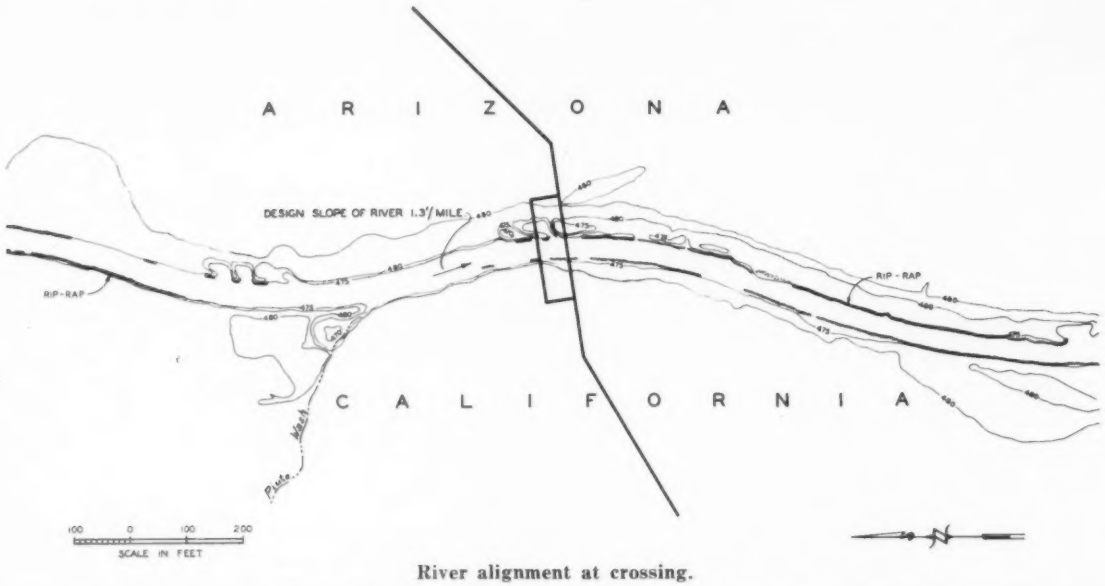
cables, and the other with a single main cable supported by A-frame towers.

Examination of the Topock site showed that (because of insufficient clear space) it would not be advisable to install another crossing between the existing crossings. Upstream the site was blocked by a highway and railroad bridge. Upstream of these bridges and downstream of the southerly pipe crossing, the river widened abruptly. An overhead structure not less than 1500 ft between main towers would have been required for a new crossing at Topock. Furthermore, the area downstream of the existing crossings was in an old lava flow, making a buried crossing unfeasible.

Further route study showed that by revising the pipeline route and selecting a crossing site about 20 miles upstream of Topock, the pipeline could cross a controlled section of the river. At that location, a channel having a radius of 9000 ft had been dredged and levees constructed for a normal channel 450 ft wide. A flood plain and second levee on the Arizona side made a second channel approximately 1000 ft wide. On the California side the natural profile rose abruptly approximately 50 ft above the normal water surface. Geological maps indicated the area is in an alluvial fan of about 800-ft depth. Soil samples taken 30 ft below the river bed confirmed the existence of alluvial deposits of sand and loose rock with no solid rock strata.

Studies of the flow of the Colorado showed that although the normal daily maximum is 15,000 sec-ft there was a daily fluctuation dictated by the needs for irrigation in the Imperial Valley. Elevation of the water surface would rise and fall 4 to 7 ft every 24 hours. At the normal maximum flow, the river depth at the crossing is approximately 10 ft, with velocities between 6 ft/sec and 8 ft/sec. The slope of the channel was originally dredged to 1.5 ft per mile, but because of deposition the existing slope is 1.3 ft per mile. It is expected that under normal conditions the channel will stabilize in the area of the crossing, with degradation upstream and erosion downstream.

In addition to the maximum flow for irrigation requirements, there is an arbitrary limit of 22,000 sec-ft imposed by the hydraulic capacity of the Davis Dam power plant. However, immediately upstream of the crossing, the Piute wash empties into the Colorado river. This drains an area of 1156 sq miles and, based on Bureau of Reclamation calculations, a 97-year storm could produce a maximum flow of 70,000 sec-



River alignment at crossing.

ft at the crossing site. This volume would be contained within the 1000-ft channel, and provided the criterion for that channel design.

Because it is classified as a navigable river, the lower Colorado is under the jurisdiction of the U. S. Corps of Engineers. Channel improvements and maintenance are performed by the Department of Interior, Office of River Control, who specified that the following conditions be met in constructing the crossing.

1. A buried pipeline had to be installed not less than 8 ft below the design invert of the channel.
2. Material excavated from the channel had to be used in the backfill.
3. Levee protection removed had to be replaced in kind.
4. The overhead clearance had to be not less than 35 ft above the water surface.

Preliminary examination of the site north of Needles revealed no condition which would rule out either an overhead or a buried crossing. Estimates of costs were made for both kinds of crossings, using the following criteria for the buried installation:

1. The top of the pipe was to be at a depth not less than 14 ft below the channel invert.
2. That portion of the pipe subject to erosion with the river at flood stage was to be on a level grade and without horizontal deflection.
3. That portion of the pipe subject to erosion with the river at flood stage was to have a minimum combined density of pipe and coating of 75 lb/ft^3.
4. The minimum radius of any cold bend of pipe with concrete coating applied would be 1200 ft.

Design standards selected for an overhead crossing were:

1. Length of the overhead structure would be 1500 ft.
2. The minimum safety factor of the main cable would be 3.
3. A minimum clearance of 35 ft above the water surface would be maintained.
4. Wind loads were to be based on 100 miles per hr velocity.
5. The required piling length was assumed to be 125 ft.

Pacific Lighting and Transwestern felt that a buried installation should be considered because a crossing differing from the existing installations would improve the odds that one gas system would continue to operate regardless of what freak of nature might occur. Furthermore, a dual pipeline crossing was indicated because of the increased probability of maintaining continuous service through the new system. The crossing would cost but a fraction of a per cent of the total project, yet it would be one of the critical locations. For that reason it deserved special attention. Also, it would provide future capacity in a system designed for future increases in throughput to more than double the initial volume. Pressure drop studies showed that two 24-in. pipelines would satisfy the future capacity needs. It was agreed that a minimum spacing of 500 ft between the two lines would be adequate to safeguard either buried pipeline against critical temporary channel changes in the unlikely circumstance of a complete rupture of the other line. Overhead crossings could be spaced within 200 ft of each other.

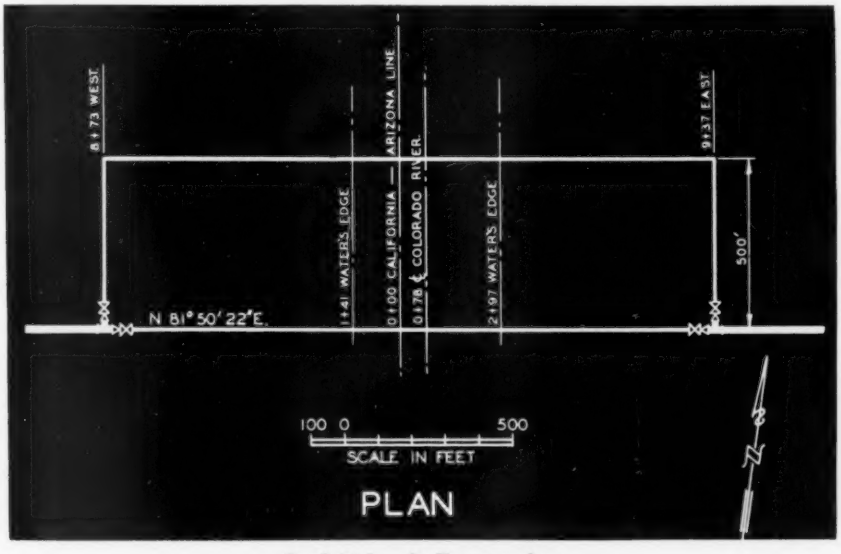
To meet the criteria for a buried crossing, it was necessary with 24-in. OD x 0.625-in wall pipe to apply a 2-in. minimum to a 2½-in. maximum thickness coating of wire mesh reinforced standard weight aggregate concrete. The use of relatively heavy wall pipe is felt desirable because it contributes to both strength and a corrosion allowance, while reducing the amount of concrete coating needed. Grade B pipe was used because of its ductility and lower price than the X grades. The concrete coating was applied over a dual protective wrap, each consisting of AWWA Type B coal tar enamel, glass inner wrap and a wrap of asbestos felt having a combined minimum thickness of ¼ in. The specific gravity of the pipe coated as described would be 1.2 and would result in a negative buoyancy of 70 lb per linear ft in clear fresh water.

Because of unsuitable conditions for curing concrete at the site, the pipe was to be coated in 40-ft lengths in a yard at Los Angeles. After the coal tar coating had cooled, a flash coat of concrete 1 in. thick was to be applied followed with a single wrap of 16-gauge galvanized steel wire mesh having a 2-in overlap with ties not exceeding 12-in. Concrete was then to be applied to the proper thickness after which it was required to keep it wet for a period of not less than 72 hours. Field joints were to be applied using the same materials and a sheet metal form which was to be left in place to retain water for the proper concrete curing. Contractor was required to leave the pipe in an undisturbed position for a period of not less than 7 days after application of the field joints. Concrete coated pipe was to be installed between a point 450 ft westerly and a point 775 ft easterly of the river centerline. The remainder of the pipe out to the valve stations on each side of the river would be coated with only a double wrap of coal tar enamel. Because of the flat contour of the crossing and stable nature of the soil through which it was to be installed, the crossing was to be constructed without anchorage at either side.

A suspension bridge to carry overhead a single 30-in. x 0.566-in. wall pipe weighing 202 lb per ft was designed by Consolidated Western Steel division of U. S. Steel Corp. It would require four 1-3/4-in. diameter main cables, with a center tower 142 ft high located just east of the easterly levee of the 450-ft wide channel. Horizontal stability was to be provided with two 1-5/8-in. cables on each side having a total width of 220 ft at the center tower.

Excluding the valves at each side of the river and company indirect costs, it was estimated that two buried 24-in. pipelines would cost $469,000, and that one 30-in. line overhead would cost $307,000. In addition, two 24-in. overhead lines carried on separate suspension bridges would cost $560,000. On a capacity basis, a 30-in. pipeline has 78 per cent that of two 24-in. pipelines and a cost estimated at 65 per cent of the two 24-in. buried pipelines. It was concluded that the increased reliability, the provision for future capacity, and anticipated lower maintenance costs over the life of the project indicated in favor of the dual pipeline buried installation.

Missouri Valley Dredging started dredging work on Feb. 21, 1960. The contractor used one 10-in. and one 12-in. suction dredge which was equipped with an Agipellor to lossen the rock and speed up the work. Dredging was done simultaneously with both machines, the smaller one in still water and the larger one in the 450-ft wide flowing channel. Larger boulders than expected were encountered, and a projection of well-consolidated clay had to be blasted on one crossing. The boulders were dropped below the design grade by dredging out the finer material surrounding them. With the fast-flowing river and a relatively unconsolidated bed, the river rapidly filled in the excavation. On the upstream side of the excavation, the slope down to the trench bottom was approximately 1:5 and downstream 1:3. Repeated dredging passes were followed as quickly as possible by pulling the pipe into place. The downstream cross-



Dual 24-in. pipeline crossing.

ing was constructed first. Material excavated from the first trench was deposited in a space between the two levees on the Arizona side. After the pipe was pulled into the first trench, the material excavated from the second trench was backfilled into the first trench and vice versa.

Pipe for each crossing was welded into a string approximately 1300 ft long on the Arizona side, where the ground level was close to river elevation. Working strips having a uniform grade were constructed opposite each leg of the crossing on which rubber-tired rollers were located at 20-ft spacing. While the pipe was on the rollers, it was welded, field joints were applied, and a hydrostatic test conducted at 1548 psi for 24 hours. Water was drained from the pipe as soon as the test was completed.

At the minimum 1200-ft cold bend radius, the calculated stress in the concrete was 2760 lb/in.^{2}, and a longitudinal stress of 4830 lb/in.^{2} in the pipe. Thus, in many installations, the concrete becomes one of the limiting factors which dictate bending large diameter pipe prior to coating with concrete.

Pipe was winched into the excavation by pulling only from the California side. Forward progress of the pipe was approximately 15 ft per min. and not allowed to stop once the pipe was under way. The pipe was empty and further lightened with buoys to keep it from gouging into the trench bottom. The importance of keeping the pipe in motion was demonstrated on the first crossing. After it had been in one position for about 90 seconds, it was found to be about 5 ft short of final position, but in that brief period the silt had consolidated around the pipe so firmly that the equipment could no longer move it.

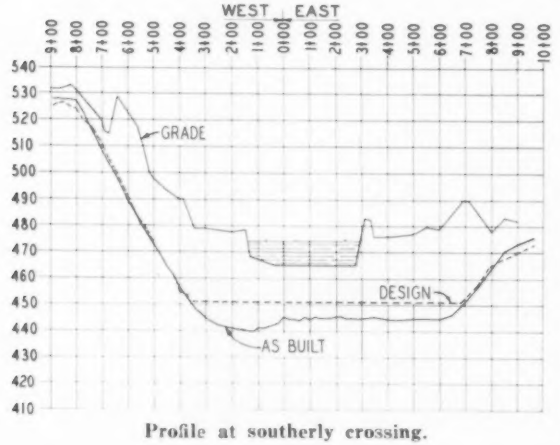
The adequacy of the design criteria at 75 lb/ft^3 density was demonstrated when the contractor found it necessary to lower about 200 ft of the pipeline to meet design grade. During this period, with the combination of water and mud producing the heaviest environment likely to occur, the pipeline was successfully dropped into position by dredging along each side of the line. Final position of the pipeline was approximately 5 ft below the minimum of 14 ft specified.

Valves are installed on each side of the river so either or both 24-inchers can be in service or blown down to atmospheric pressure. On the low Arizona side, an access road, protected with riprap, is installed between the valves and the flood levee. The valves and pipeline at that location are held at normal elevation and operated with extension shafts from the surface of the access road.

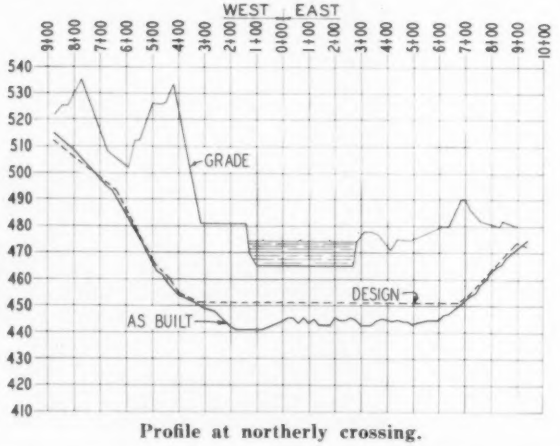
Each 24-in. line is electrically isolated from the other and the connecting pipeline systems. Tests conducted after the pipeline was in service showed a current of 30 milli-amp would protect both lines across the river. This has been provided by installing four 35-lb magnesium anodes on the crossing which, at the initial drainage rate, will have a theoretical life of 200 years. Although it is normal for the current requirement to increase as the facility becomes older, it is clear that the pipeline protective coating is sound.

Buried river crossings, in spite of their highly individual character, can be designed and installed to meet the conditions imposed by their environment. But this is equally true of overhead structures. The key to a satisfactory method of installation will probably lie, in most cases, in the degree of accuracy with which the behavior of a river can be predicted. If little information is available or the river control is questionable, it is likely that the uncertainties will increase the cost of a buried crossing more than one carried overhead. In every case, it is incumbent upon the designer to approach his assignment without a preconceived notion of how a crossing is to be constructed. Considerable study may be required to evaluate all the factors—and the type crossing finally installed may differ from the kind initially contemplated just as it occurred in the Transwestern Pipeline Co.-Pacific Lighting Gas Supply Co. Colorado River crossing. ■

This article is adapted from a talk presented at a meeting of the pipeline division of the American Society of Civil Engineers held in Phoenix on April 10.



Profile at southerly crossing.



Profile at northerly crossing.

automation in gas industry operations

Part IV of a field study in depth: Colorado Interstate Gas Co. Texas Eastern Transmission Corp.

By KEN KRIDNER

ALTHOUGH gas distribution companies have taken the lead in the use of high speed electronic computers for dispatching functions, transmission companies have presented the gas industry's greatest area of advance in the use of automation—predominantly in automation of compressor station facilities. It would appear that operations of transmission companies lend themselves more readily to the use of automatic control.

Accepting a control center as the "hub of operations" of a transmission system, one can see the extent of operations when visualizing the great distances that must be spanned to bring gas from origin of supply to point of consumption. To provide closure of the gap between the two points, gas transmission companies have constructed big-inch pipelines with compressor stations at fairly regular intervals to inject energy to move gas through the pipeline. At these stations, large horsepower prime movers furnish power to drive either reciprocating or centrifugal gas compressor units. At input points on a pipeline system and at terminus points there are metering stations where gas is metered and its pressure regulated.

Certainly here are the ingredients for automation—*distance* making it necessary to provide contact by either voice or signal; a *repetition of function* existing under intermittent operating requirements; for example, the varying requirements for horsepower to meet fluctuating load conditions or customer demands necessitating changing of pressure set-points; and a *communications media* whereby signals may be originated and transmitted as desired.

Where the distribution company accepts gas into its facilities at a high pressure and permits the energy to dissipate as the gas is routed through its distribution network to ultimate consumers, the gas transmission company must inject additional energy into the gas to boost it through the extensive trunkline from supply to market. Measurement, compression and regulation are all primary functions of the transmission company along with a communications system to permit voice and signal access to remote sites.

Many gas transmission companies operate on a relatively low load factor—load factor being defined as the percentage of design capacity that is utilized. Although load factor may also be defined in terms of installed horsepower, the volume basis is more widely accepted. Since load factor bears a definite relationship to gas consumption and therefore climatic conditions in the market area, it follows that operation of a transmission system depending upon consumption in the market area and having little or no storage facilities, would be dependent in part upon weather conditions for its horsepower requirements. This, in turn, would necessitate starting and stopping of engine-compressor units to maintain desired pressure conditions throughout the pipeline system.

To date, activities of gas transmission companies have been in the direction of compressor station automation. This has accomplished starting and stopping of individual compressor units, coupling of compressor units to achieve a desired pressure condition and remote reset of pressure set-point. As a result of these implementations, the companies have found that

they can operate facilities more efficiently and with a smaller operating crew in attendance. Utilization of automated facilities would appear to be resulting in upgrading transmission company personnel who are being given an opportunity for individual growth in the operation and maintenance of new equipment.

Technical personnel responsible for evaluation and recommendation of automatic controls have found that there are two different philosophies of operation that are existent in industry. These may be termed "remote control" and "self-contained" units.

A facility that is under remote control involves primarily the location of the person initiating the signal for each operation. An abundance of information is transmitted from the unit to be controlled to the centrally located operator. Acting upon information received, the operator then makes his decision and actuates the function desired by transmission of a signal relayed back to the controlled unit. The principal disadvantage of the remote controlled unit is its reliance upon communicated information and, therefore, its reliance upon a communications media.

The self-contained unit differs from remote control in that it receives only a single instruction from the remote operator. Station equipment then performs in a predetermined pattern of operations to achieve the desired condition. Loss of communications in this type of control results in the unit continuing to operate on the last received instruction until shut down, if necessary, by protective equipment. Data as to station operations is logged and printed out as desired by station hardware. A minimum of information is transmitted to the remote operator. In this concept of operations, the remote control center has no control over the station operations except for the single instruction as to discharge pressure. All other decisions are the result of control equipment at the station.

Currently there are two different types of equipment being utilized in such automated systems. There are solid-state systems incorporating diodes and rectifiers in their circuitry for an increased speed of operation; and the electro-mechanical systems using relays with their extensive background of dependability and experience, but having a slower closure time. It would appear that the principal difference between the two systems is in the speed of operation since to date, both have displayed excellent dependability.

In this analysis of the use of automatic controls by gas transmission companies, we have endeavored to select companies which accept philosophies existent today in the field of automation. The reader may note the absence of an installation in a company that is familiar to him and advanced in the use of automatic controls; however, we trust that in place thereof, the reader will find satisfaction in the description of another facility with the same philosophy of design.

COLORADO INTERSTATE GAS CO.

COLORADO INTERSTATE is one of the oldest long-line transmission companies in operation today, having started operations in 1928. The compressor stations on its old Dresser-coupled pipeline from the Bivins conditioning plant to Denver, Colo., utilize horizontal gas engine-compressor units, all of which are scheduled to be abandoned upon approval and installation of its Utah or Rock Springs project. The remaining compressor stations on Colorado Interstate's system utilize angle gas engine-compressor units of the reciprocating type. It does not have any electric motor or gas turbine prime movers nor centrifugal compressors in its system.

In accordance with general operating procedures for the Rocky Mountain and Mid-Continent regions, CIG finds itself operating more than 1000 gas wells covered by purchase contracts. Gas from these wells is delivered into its field gathering systems in the Panhandle, Texas; Keyes, Beaver county and Mocane, Okla.; and Morton county and Hugoton, Kan., gas fields. Gas from the gathering systems in the Panhandle and Hugoton fields is processed through Colorado Interstate's conditioning facilities and thence delivered into its trunkline system.

Colorado Interstate has no storage facilities in its marketing area. Therefore, it must rely upon line pack and the dexterity of its dispatchers to provide an adequate supply of gas to meet customers' demands at all times. W. I. Blount, CIG's superintendent of dispatching and communications, has many years of experience in routing the flow of gas through the company's pipeline system and is recognized throughout the gas industry as a leading authority on dispatching. The recent additions of an improved flow telemetering system and the installation of automatic control equipment at compressor stations, Blount has indicated, will do much to improve the performance of the dispatchers in controlling gas flow through the system.

Colorado Interstate's diverse pipeline system, its low load factor and the absence of market storage facilities, coupled with the anticipated extensive construction program on its system, presented management of the company with a challenge. In 1957, Colorado Interstate formed a "study group" composed of company representatives and personnel of industry engineering and construction companies to clarify the objectives, means and limitations of automation. After a thorough review of existing facilities and an evaluation of the equipment available, the group arrived at conclusions that: (1) automation was feasible, (2) most of the necessary equipment was available, (3) there were no technical obstacles in application, and (4) automation did present economic advantages.

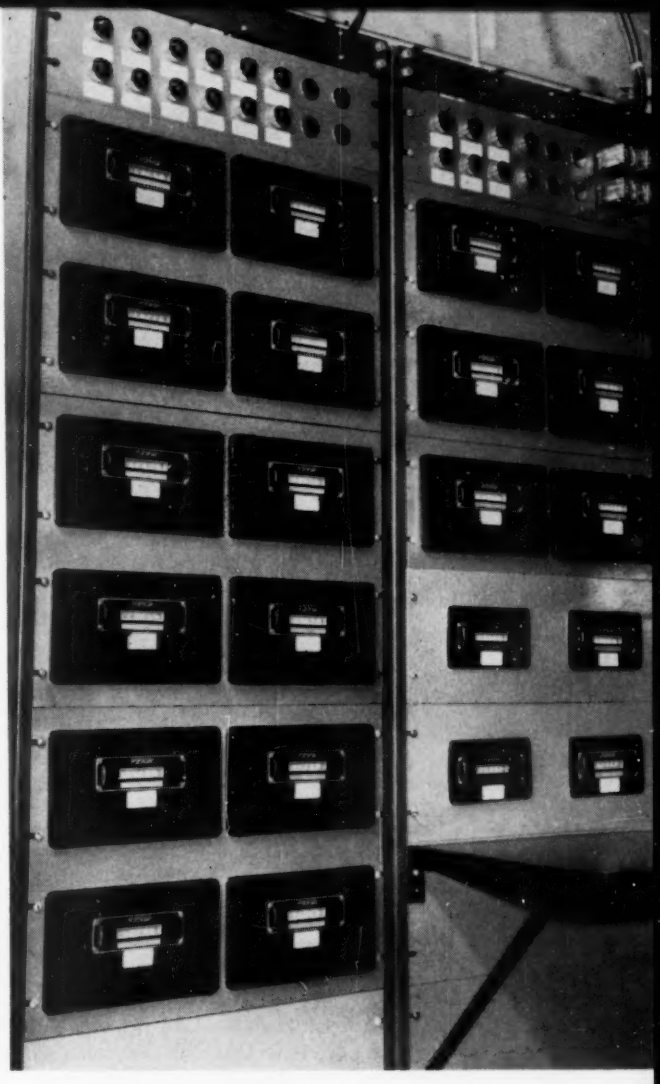
The concept of automatic control accepted by Colorado Interstate is that of self-contained units, whereby the compressor station or other function being controlled is treated as an integral unit, self-

operating and requiring only a single instruction from the remote control center. The remaining operations would be performed in accordance with a programmed sequence of operations at the local point. In automatic control of a compressor station, the dispatcher would telemeter an instruction for discharge set-point of pressure over the communication medium to the station. There, the signal would be received on a set-point controller which would adjust the set-point of the discharge pressure controller at the desired value. No other information would be required from the control center to the station for automatic operations.

The discharge pressure controller would compare actual discharge pressure with the desired set-point instruction, and the output of the controller would increase or decrease the speed of the engines in use as necessary to achieve the desired pressure at the discharge of the station. If the speed range of engines would not permit achieving the desired pressure with the engines in use, then the engine selector would add or substract an engine by initiating a signal to individual engine sequence units to start or stop an engine or engines as required. An adequate time delay would be provided in the programming to prevent excessive engine starting or stopping.

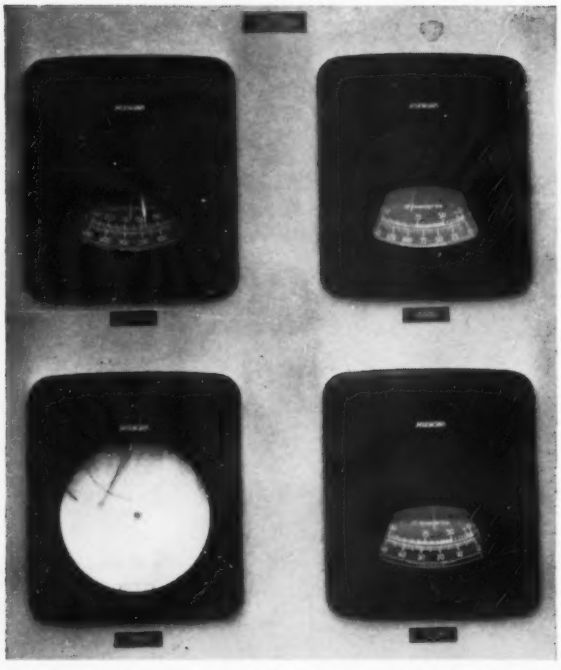
Auxiliary equipment at the stations would be independent of the control received from the remote control center and would be self-controlling. Adequate protective and monitoring hardware would be installed to protect the station equipment and to furnish operating personnel with required information pertaining to station operations.

Having determined the feasibility of an automated compressor station as a self-contained unit, Colorado Interstate management made the decision to modify its Springfield, Colo., compressor station to utilize automatic control equipment, thereby permitting the technical personnel of the company to develop and improve their theories, to study the hardware used, and



ABOVE: Counter units located in CIG's control center in Colorado Springs. One counter unit is required for each meter station.

LEFT: Portion of CIG's communications control center. The control console and monitor for the automatic control system is located at left rear.



Display equipment at CIG's south Colorado Springs meter station. Instrument at upper left telemeters the high and low pressure at the station. The other three instruments are used for obtaining and telemetering the flow.

to permit training of company personnel in the art and problems of an automated facility. The decision was made to use solid state equipment.

Modification of the Springfield station presents an excellent example of revisions that can be made to existing manually operated stations using reciprocating gas engine-compressor units to achieve continuous unattended operation. The station, erected in 1953 by Fish Engineering Corp., utilizes four Cooper-Bessemer GMVA-10, two-cycle, gas engine-compressor units. The auxiliary electric generators are driven by Ingersoll Rand PVG-6 gas engines.

Modifications that were made on the Cooper-Bessemer units included: revisions permitting operation of the engine at speeds down to 200 rpm; replacement of the lube oil pump to increase capacity and oil pressure at low speeds; installation of a centrifugal coupling to prevent low speed crankshaft, torsional vibrations from carrying over into the gear train driving the scavenger blower; replacement of the governor and tachometer and installation of power-operated cylinder unloaders. On the Ingersoll-Rand auxiliary units, the fuel and cut-off air valves were equipped with motor operators, existing protective devices were modified and a generator frequency control was added to maintain close regulation of the 60-cycle power.

In addition to these revisions, other minor changes were required and miscellaneous protective devices were added. The adaptation of the station to automatic control demonstrated the effectiveness of conversion of existing reciprocating units to automation.

The equipment installed to complete the unattended function of the station as a self-contained operation included:

Telemeter equipment—Furnished by Southwestern Industrial Electronics Co. (SIE), of Houston, the system used is the SIEMARC digital telemetering system employing multiple tones that transmit digital data as combinations of two carrier frequencies. The system is capable of a speed of 10 digits per second and operates over a voice channel of 350 to 2750 cps bandwidth.

Pressure controller—Furnished by The Foxboro Co., the discharge pressure recorder-controller receives the discharge pressure from a Foxboro pressure transducer and the set-point pressure signal is introduced as an electrical signal after being received at the station over the telemetering circuit.

Engine selector—Designed by Stearns-Roger Mfg. Co. of Denver and manufactured by SIE. The engine selector determines the engine units to be started or stopped and initiates a signal to the engine sequence panel of the applicable engine. The sequence in which the engine units are added or subtracted is accomplished through manual activation of the control push buttons mounted on the front of the engine selector panel, permitting station personnel to equalize the hours of use of engines by varying the position of the engine in the starting or stopping sequence. Another feature of the equipment is the use of stepping switches as counters. The stepping switches are used to determine the loading or unloading of compressor cylinders; to select time delays between successive starts and stops; to provide the telemetering system with information to be transmitted and to operate the station block valve.

Engine sequence controls—Also designed by Stearns-Roger and manufactured by SIE, these units also use stepping switches in their circuitry. There is one controller for each compressor unit. The function of the engine sequence controller is to program the engine through its starting cycle, to activate the valving around the compressor and to bring the engine on the line in an idling condition. At this point, a signal to the engine selector unit indicates the engine-compressor unit is available for loading.

Monitoring and logging—A log-alarm-shutdown system is provided to monitor 99 switch contacts that are connected to detection equipment at the station. When any of the contacts close, the logic circuits of the system determine the action to be taken, whether the function shall log, sound an alarm, shut down an engine, blow down the station or a combination of the three. A Hewlitt Packard digital recorder is used to print out data pertaining to any of the 99 functions that may be off-limit. An Assembly Products, Inc., scanner is used to periodically scan 24 temperatures as sensed by thermocouples mounted on each engine.

The equipment installed in the control center in Colorado Springs was furnished by SIE and consists of the control console, a display unit and the data-log typewriter unit. The display unit permits the dispatcher to readily observe the discharge and suction pressures at the station. In addition, the dis-

charge set-point is visually displayed permitting the dispatcher to detect instantly any deviation between the set-point transmitted and the discharge pressure. The data-log unit is an IBM 30-in. typewriter used to print out either periodically or on-demand the information as displayed on the visual display unit and in addition, the per cent speed at which the engines are operating and the number of engines in use. The typewriter unit is also actuated on the start-up or shut-down of an engine at a station, thereby giving the dispatcher a complete printed record of the station operation. Indicator lights on the visual display unit give information as to an engine out-of-service (indicating a decrease in a station's available horsepower), the station on manual control, an emergency shutdown, an invalid reply, no-reply and a line failure. An indication of no-reply indicates either failure of equipment at the station or loss of the communication media; however, no indication of a line failure would show that the failure was in station equipment. The line failure check utilizes a filter placed in the circuit at the station whereby the signal is transmitted from the control center, is received at the station, passed through the filter and retransmitted to the control center. If the signal is received at the control center, the indication would be that the communications circuit was functioning properly.

The console unit was manufactured by SIE and includes space for control of additional stations that may be installed in the future. When the dispatcher desires to transmit a discharge pressure set-point, he first selects the station for which the instruction is intended by depressing the button for that station. He then depresses the buttons corresponding to the value of the set-point instruction he wishes to send. The buttons depressed will light, permitting the dispatcher to visually verify the set-point information. If the information is correct, he depresses the transmit button and the data is transmitted to the station. If the signal is valid, the station equipment will accept the data and retransmit the signal to the control center. The lights on the buttons will go out and the dispatcher knows that the instruction has been received at the designated station. Should the signal be valid but there is a line failure or equipment failure at the station, the lighting of other display unit target lights will indicate the trouble. By observing the value of the suction and discharge pressure, the dispatcher can verify that the instruction has been carried out.

The success of their automatic control installation at the Springfield station resulted in Colorado Interstate incorporating similar equipment in its Rawlins, Wyoming compressor station. The compressor station construction proposed by the company in its Utah project will also incorporate self-contained units designed to utilize the experience and knowledge gained from the operation of the facilities at the Springfield station and will incorporate the latest developments of automatic control. Operation of the Springfield station by Colorado Interstate has permitted the company to provide on-the-job training for its personnel in the many facets of automation, improving the knowledge of the employee in the theory and maintenance of hardware utilized in an automated facility and upgrading the skills of the personnel involved.

Flow data telemetering

In addition to automating its compressor station equipment, Colorado Interstate has installed a Foxboro Teletax telemetering system. This permits transmission of flow data from remote metering points reflecting the percentage of meter station capacity utilized. The information transmitted is used by the dispatcher in the control center to permit a more accurate calculation of the flow rate of the gas entering and leaving the transmission system thereby improving the overall efficiency of operation.

The pressure taps for the flow recorder used in conjunction with the telemetering equipment are placed across the same orifice fitting as the taps for the orifice meter used for gas measurement and billing. This permits an opportunity for verifying the accuracy of the data obtained from the equipment installed. Colorado Interstate uses multiple meter tubes in its larger sales stations. In those instances where it is desired to transmit data as to flow rate, the differential pressure instrument for telemetering is placed across the orifice fitting on the number one tube. The flow rate calculated through this tube is then increased in accordance with the number of tubes in use on the assumption that the gas flow will be equally divided among the tubes in service where all tubes have the same beta ratio. However, due to the configuration of the header assemblies, this assumption has been found invalid. To avoid the resultant error in calculated data, CIG in some instances has installed equalizing lines connecting the upstream tap on each tube to the high side of the orifice meter and similarly the downstream tap on each tube to the low side of the orifice meter, where flange taps are in use, thereby obtaining the arithmetical average of the differential pressures on all meter tubes to be recorded on the flow indicator for telemetering.

The Foxboro system utilizes a flow indicator, a pressure indicator and a recorder-transmitter together with square root cams and Dynaformers at each station to obtain the value of $\sqrt{hP/T}$ for transmittal to the control center. The Foxboro Teletax Transmitter generates a time pulse switch closure of 0 to 12 seconds duration out of each 15-second time interval. The duration of this time pulse is proportional to the gas flow, $\sqrt{hP/T}$, with a 3-second pulse representing zero flow and a 12-second pulse representing 100 per cent flow. The equipment is provided with a switch to correct for the number of tubes in service and permitting the telemetered data to indicate the percentage of station capacity in use regardless of the number of meter tubes in service. Therefore, if the station has four meter tubes and all are in service, the switch would be placed at the position 4. If one tube were temporarily closed off by action of a flow controller, then circuitry within the equipment would compensate for this loss in capacity and at full differential and static conditions, the value transmitted would indicate 75 per cent station usage. However, if the valve on the run were to remain closed for an indefinite time, the field operator would turn the position of the switch to "3" whereupon the value transmitted for full differential and static pressure conditions would indicate 100 per cent usage.

The data is received in Colorado Springs on digital

counters and reflect a number of counts per hour based on 720 counts for 100 per cent flow. The dispatcher then multiplies the count received for the hour by the flow coefficient for the station to obtain the gas flow for that hour directly.

The data is transmitted in an analogue form. Therefore, any loss of communications results in loss of count for the time that the communications circuit is out of service. To correct for the count that was not received, the dispatcher must manually correct the dials to reflect the proper reading. However, the use of this equipment permits a close approximation of the gas volumes throughout the system.

For the past two years, Colorado Interstate has utilized teletype equipment between Colorado Springs and Beaver, Okla., for sending instructions to field personnel as to well settings for gas wells connected to its field gathering system. In the past, personnel of Interstate have also experimented with the use of facsimile transmission between Colorado Springs and Masterson, Texas, for transmittal of company operational data between the two points.

Colorado Interstate though numbered among the oldest in operating history in the gas transmission industry, has forged to the front among the leaders of progressive thinking and action under the close guidance of W. E. Mueller, president of the company, and of Neal B. LauBach, vice president in charge of operations. LauBach directed the activities of the study group established by Colorado Interstate to investigate the advantages that might be experienced from the adoption of automation in compressor station operations. He has recently received industry recognition by appointment as chairman of the automation committee of the Operating Section of the American Gas Association.

TEXAS EASTERN TRANSMISSION CORP.

IT was in early 1958 that Texas Eastern initiated operations at its Linden, N. J. compressor station as a satellite remote controlled installation. The philosophy applied by Texas Eastern to this station was unique to industry at this time. It permitted an operator some 40 miles distant from the station to direct the operation of three gas engine-compressor reciprocating units, starting and stopping the engines and adjusting the speed as necessary to give the desired discharge pressure conditions.

A large amount of information was transmitted over leased wire lines from the compressor station to the office of the remote operator, permitting the operator to observe measurements of temperatures, pressures and flow rates before and after effecting a change in operating conditions. The operator was furnished about all the information that could be given to him without his looking at the units.

The operation of the Linden station took into consideration the use of the facility in the overall picture of Texas Eastern's system. Located near the terminus of its long line transmission system from Texas and the Southwest, the station was to furnish compression during peak load periods of the winter heating season. This requirement for intermittent operation of the station made it desirable to utilize the minimum number of permanent personnel while not detracting from the availability of the station horsepower as required.

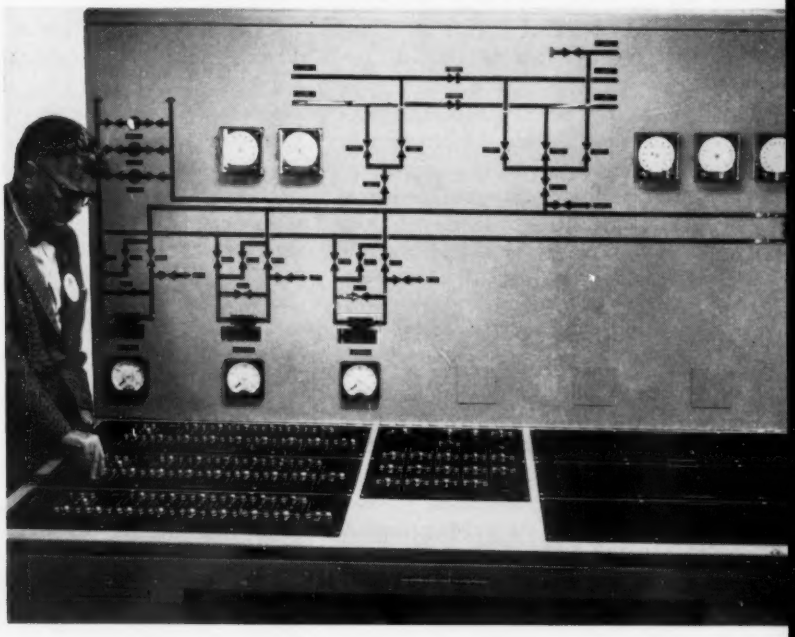
The utilization of the Linden station is accomplished in the following procedure. When the remote operator located at Lambertville, N. J., observes that the delivery pressure is dropping below an established limit, he will inspect his remote control board to determine the conditions that exist at Linden to be sure that all indications show the equipment to be in proper working order for bringing an engine on-line. He will then depress a button on the remote control board to initiate the sequence of operations that will start the first engine and bring it on-line.

Thereafter the engine may be brought up to speed to obtain the desired discharge pressure. Additional engines may be added or units stopped by the operator from his remote location. In essence, operation of the various controllable functions is displaced to the remote location. The operator at that point, aided by the information that has been telemetered to him, initiates the functions required.

A. J. Shoup, vice president and chief engineer, and Gordon Jennings, supervisor of plans and research for Texas Eastern, have stated that although the Linden station has been valuable in furnishing additional data pertaining to information required for automatic and remote operation of a compressor facility, a similar type control system would most likely not be installed today. A portion of the information relayed to the remote operator has been found to be unnecessary for the operation of the station.

Texas Eastern's existing compressor stations include large electric motor drives and gas turbines as prime movers for centrifugal compressor units. In discussing the use of electric power for the prime mover, Frank Gertson of Texas Eastern's compressor station department, pointed out at the recent PIEA-PESA conference in Galveston that when the cost of fuel gas exceeds 20 cents per Mcf and the cost of electricity is 6 mils or less, then the use of electric motors should be evaluated as the prime mover. Of the 793,710 hp that Texas Eastern has installed on its transmission system as of Jan. 1, 1961, one-third was represented by 13 gas turbine stations, one-third by 23 electric stations and the remaining one-third by 28 gas engine stations.

Of particular interest in the review of Texas Eastern's facilities is the degree of automatic control evident on the system due in part to the use of electric motor drives and gas turbine units, both of which are very adaptable to automation. These prime movers may be considered as individual self-contained units, since they may be placed in service by actuation of an initiating switch and brought on the line without further manual attendance.



BELOW: Control console at Lambertville enables operator to supervise functions of remotely controlled Linden station. Panel in top contains schematic diagram of piping in Linden along with dials designating pressures and temperatures at the station and speeds of Linden compressors. Blank spots at right are positions available for future use. At left is F. Vinton Long, supervisor of communications for TET's engineering department. Left: Control console in Lambertville compressor room provides supervisory control over remotely controlled Linden station. Dials at top record suction and discharge pressures and show speed of Linden's prime movers. Lights below indicate state of units at Linden; pushbuttons control actual operation.

The reciprocating gas engine stations on the system are composed of units ranging in unit horsepower from 1000 to 3400 and consisting of 193 units.

One area in which substantial work should be directed in the future consists of the development of receiving, transmission, and communications facilities that are compatible with the speed of modern electronic computers. Future use of high speed electronic calculating equipment with advanced EDP systems will provide pipeline dispatchers with continuous economic analyses of pipeline operations and with high-speed automatic control of entire pipeline systems to insure optimum operation under varying conditions of load. This futuristic approach to an existing problem could result in substantial savings for a transmission company.

It is possible that as markets become more associated with season and space heating loads, pipeline operation in the near future may undergo a dilution of its historical high load factors. At that time, it will be necessary to operate on a low load factor or to utilize gas storage facilities in or near the market area. Thus a pipeline might be required to operate on a low load factor, whereby an automated facility offering maximum and efficient utilization of facilities would not only be desirable but would be an economic necessity.

FOR NEXT MONTH

We will continue to look at the facilities of transmission companies in the August article. The September issue will be devoted to various items of electronic and mechanical equipment that is on the market today for utilization in the automating of gas industry facilities.

Comments from readers will be welcomed and acknowledged concerning any item discussed in this series. Letters should be addressed to Ken Kridner, GAS Magazine, 198 S. Alvarado St., Los Angeles 57, Calif.

I should like to express my appreciation to Leon Henry and Karl Hagius of Colorado Interstate Gas Co. for information provided on the operation of their facilities.

ANNOUNCING: Two new package control units to simplify sequencing in compressor station operations

New UNION automation modules cut costs, provide first steps for complete pipeline automation

Since 1953 Union Switch & Signal has been providing the pipeline industry CENTRALIZED TRANSPORT CONTROL SYSTEMS that integrate all the elements of automation. The UNION systems are based on digital techniques that provide the ultimate in security and reliability . . . assure accuracy and substantially reduce operating costs.

Part of every UNION CTC SYSTEM is sequence control which we are now making available to the pipeline industry.

These modules make possible compressor station automation and, when installed, form the basis for future automation of pipeline operations.

UNION sequence equipment provides the user with: Accuracy • Security • Reliability • Low Maintenance Cost • Flexibility of Operations.

Angle engine compressor sequence control

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By simply pressing a button on the sequence cabinet, the compressor will safely start, properly load and operate. Pressing another button will unload and stop the machinery. All of these operations are performed automatically and under the surveillance of monitoring devices.

UNION relays of the type used in this CTC system have been in service for more than ten consecutive years without requiring maintenance. An average of 4 million operations per relay per year is not an uncommon requirement in actual installations we have provided. Their operating characteristics do not change over a temperature range of −45°F to +160°F.

Unit loading valve sequence

Where unit loading valve operations are performed manually at existing stations, or where compressor unit valves and main drive units are separated by fire walls which make manual operation impractical, Unit Loading Valve Sequence equipment provides the means for operating the suction, discharge, purge, vent and by-pass valves for proper loading and unloading of the unit under all conditions.

UNION Unit Loading Valve Sequence employs the same type of relay used in the Angle Engine Compressor Sequence Control. These extremely high-quality relays make it possible for us to provide the pipeline industry with the most reliable sequencing equipment presently available.

If you would like to have more information on these two new UNION control units, write for Bulletins 2008 and 2009, or call Union Switch & Signal, Pittsburgh 18, Pennsylvania, CHurchill 2-5000.

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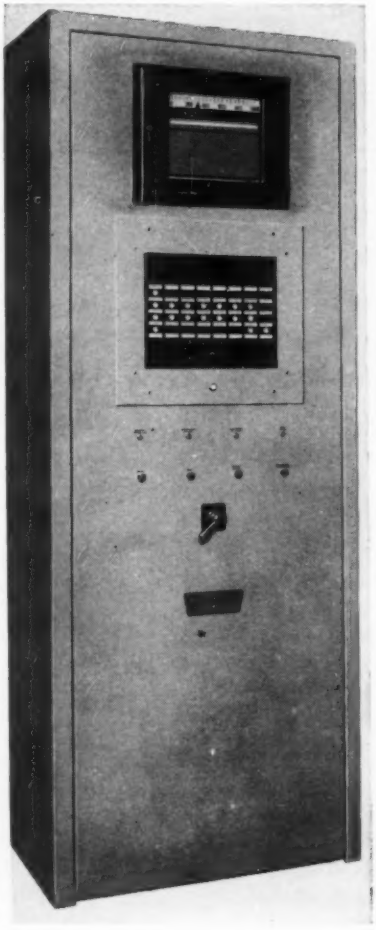
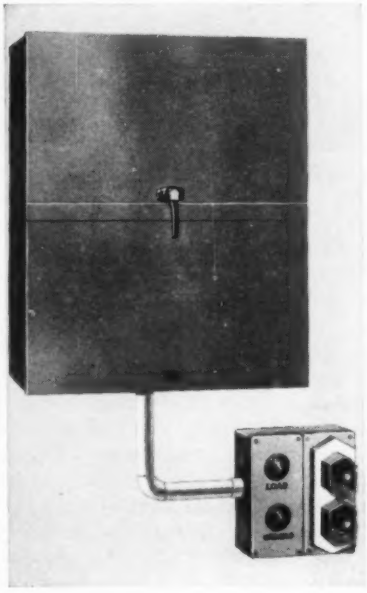




Unit Loading Valve Sequence. The installation of Unit Loading Valve Sequence equipment is the first logical step toward the eventual complete automation of compressor stations.

Angle Engine Compressor Sequence Control. Adaptable for sequencing of 2- and 4-cycle engines, or turbines equipped with reciprocating or centrifugal pumps of compressors.

By KEN KRIDNER • Engineering Editor

What are the advantages to mass measurement?

SUPERVISORS in control of direction of the policies for gas measurement today are constantly confronted with articles proclaiming the advantages to be obtained from the use of mass measurement. To many this may appear only another novelty devised to satisfy the whim of scientists with nothing better to do. To others, it opens the frontier of development for improved measurement. To the remaining majority, it is not even noticed. And it is to those in the majority where the acceptance must be accomplished, where sleeping dogmas must be awakened to a whole new field of concept and application.

Advocates of mass measurement are quick to point out the advantages to be gained by the elimination of measurement of the many variables necessary in the computation of gas flow as specified in the American Gas Association Committee Report Number 3, the recognized criterion for gas measurement. To complete the calculation of gas flow using mass measurement, only two variables need to be determined: the density of the gas passing the metering point and the differential pressure at the metering location.

However, to pass off so lightly the determination of the gas density is an error indeed. For this variable is difficult to determine to the degree of accuracy necessary for acceptable gas measurement and the magnitude of the quantity is so minute as to defy the efforts of technicians. Efforts to date have involved the use of synchronous motors, of magnetic couplings and other devices as yet unfamiliar to persons actively engaged in gas measurement at this time. In addition, the obtaining of a representative sample has presented a very formidable obstacle, for the density determined must be of the same gas for which the pressure differential is determined.

Why use mass measurement, the man in the field may ask? Certainly, we have been using orifice measurement for many years and there appears to be no evident reason why it should be discontinued at this time. But the answer lies in two channels. First, there has never been any agreement in the industry across the nation as to what constituted the standard pressure base for the cubic foot. And, second, with the advent of automation there arises the necessity for a concentration of data required for transmission.

Possibly we may take these two items in order and delve a little deeper into them. With all the efforts of people in the industry to accomplish the accurate measurement of natural gas through use of improved metering devices and application of more extensive and better researched correction factors, why is it that the cubic foot is not the most acceptable unit of measurement? Certainly people in industry closely associated with the metering of gas are to be commended for the progress that has been made in recent years to provide us with more accurate determination of flow. However, even though these efforts from company to company have been extensive, throughout the industry and the nation, the measurement people have been unable to arrive at an agreement as to the most proper pressure base to use. Also, the manufacturers are yet searching for better equipment to permit accurate determination of such basic elements as the specific gravity, the supercompressibility and certainly the pressure drop across the restriction placed in the calibrated flow section. Tests are still being conducted to determine the influence of pressure upon the accuracy of equipment.

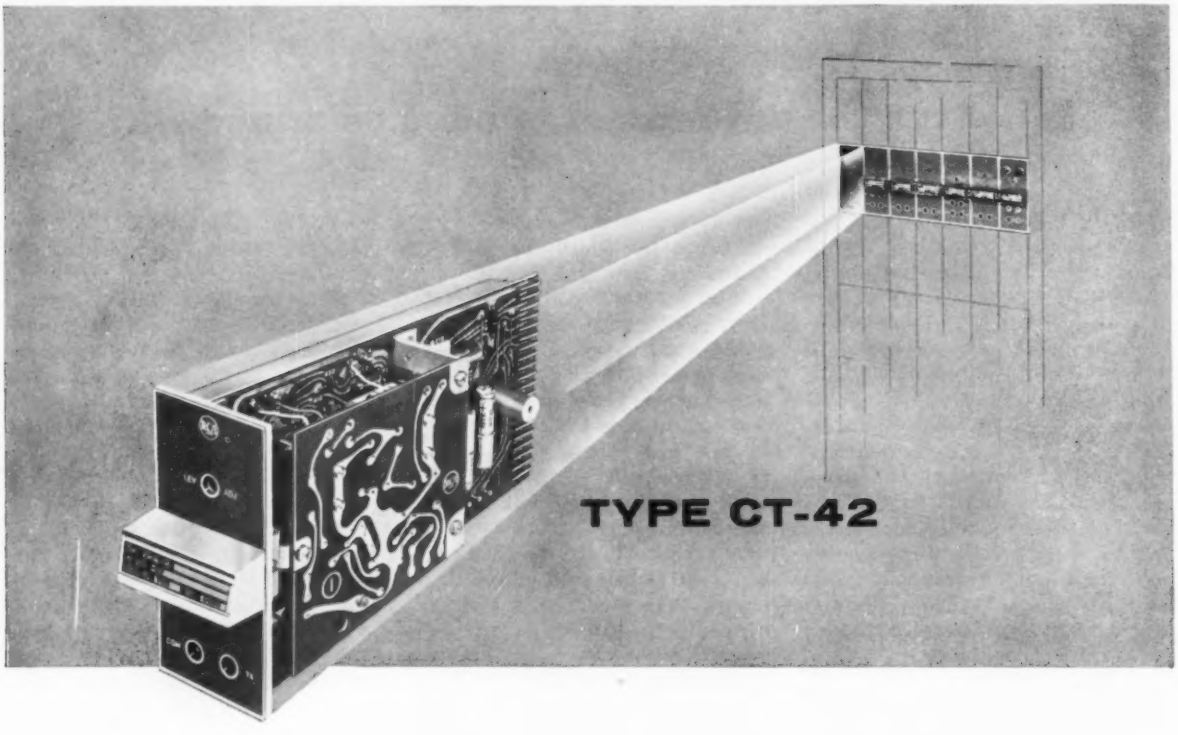
The second point, that of the advent of automation and its impact upon industry and measurement facilities in particular: To date the extent of application of remotely controlled and self-contained automatic facilities has been restricted to compressor station facilities and, to a small degree, the control of regulating equipment at the sales points. Efforts to transmit data pertaining to gas flow characteristics have been resolved in the most common instances to that of transmitting the differential and static pressure components possibly augmented by the temperature.

In a few more refined installations utilizing orifice measurement, the product of the extension divided by the temperature has been transmitted. However, in each of these instances, no effort has been made to identify the transmitted data as suitable for customer billing. The problem presented when using orifice measurement may be clarified when the flow equation is examined. Factors for the plate tube coefficient, the specific gravity, temperature, supercompressibility, Reynold number, expansion and meter must all be taken into consideration. With the exception of the gravity, temperature and meter factors, each has a definite relation to the differential and static pressures and the temperature or a combination of the three. Therefore, to devise an instrument that can be used to arrive at the correct value of flow at the measuring site for transmission resolves into a difficult task.

Many people have asked what degree of accuracy is required in the calculation of the flow to be acceptable to the seller and buyer

Continued on page 116

NEW... FROM RCA



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Communications Tele-Control

By F. VINTON LONG

Tele-control and data handling channels

OFTENTIMES it is hard for a non-communication man to understand the language of tele-control, data handling, and communication men. Confusion often exists as to names of varied circuits leased by the common carriers, or provided by private facilities.

Let's start out with a few:

"Full Duplex" operation means that there are two separate and independent circuits (which may be wires or carrier channels), one going away from you, and one coming in to you; or as communication men say: "Eastbound and Westbound." (See *Fig. 1.*)

These can be either voice grade channels, telegraph grade (for teletype), or signaling grade (slow speed telemetering or tele-control).

The advantage is that simultaneous east and westbound (or 2-way) signaling or intelligence can take place. For instance, in tele-control work you can be sending out commands to remote stations without interrupting incoming data values.

What many people do not realize is that all microwave and telephone carrier transmission is inherently 4-wire, full duplex operation, and that it costs both private users and the common carriers to provide equipment to combine east and westbound terminals at each end into 2-wire drops such as connect your telephone into long distance lines through local telephone exchanges.

Because of its greater flexibility, less cost, and far easier operating restrictions (no balancing networks are required), almost all privately owned microwave, tele-control, and data handling channels should be operated full duplex. Where possible, telephone channels should also be so operated.

Because long line common carrier circuits are inherently 4-wire full duplex, it is quite easy for them to provide you, on request, this type service at a nominal additional charge. Most of this charge is caused by the fact that 4 wires (2 pairs) instead of 2 (1 pair) must be run from the local telephone exchange into your office. This service should be carefully considered for tele-control as it has many possible advantages.

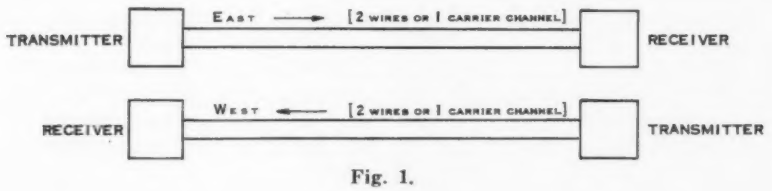


Fig. 1.

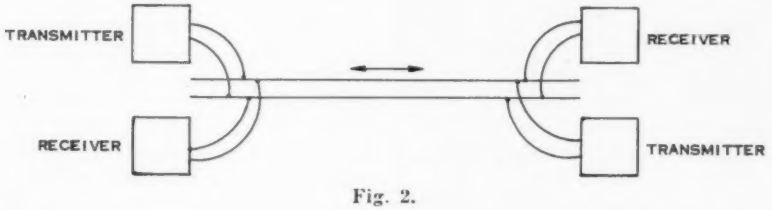


Fig. 2.

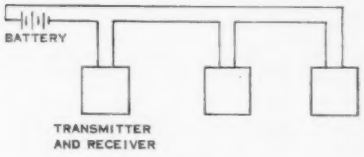


Fig. 3.

A simplex line is simply one half of the full duplex line, shown in *Fig. 1.* You transmit in one direction only, either east or west, but not both.

A half duplex line enables you to transmit and receive either east or west, but not simultaneously. An example of this is your common teletype printer operation. This is shown in *Fig. 2.*

Another configuration is shown in *Fig. 3.* This is common with a multistation teletype system or some types of supervisory control systems. In some cases only 1 wire can be used instead of a pair in this "round robin" arrangement.

If a voice-type, full duplex circuit is used, as shown in *Fig. 1,* you may divide each (or either) east or westbound channel into subchannels, up to 18 tones, for data handling or supervisory control work, each operating entirely independent of the other. You may also use it for "voice-plus" operation; that is, voice plus a very limited number of tone subchannels (usually not more than 4). However, this arrangement is not usually recommended because of our voice tones sometimes being mixed up with the subchannel telemetering or data handling tones, causing garbling.

Whether to use a half duplex or full duplex type circuit, and whether to provide or lease a slow speed

Continued on page 116

M-A-C—Con't. from page 113

alike whereby the volume might be used for billing. My answer has always been: An accuracy of one-quarter of 1 per cent deviation from the volume as computed at the measurement location when applying all factors in accordance with existing standards.

Why would mass measurement be preferable over the existing procedure? This again is a matter of opinion but it would appear to me there are several points in favor of mass measurement.

The end result of calculation using mass measurement is the pound. Therefore instead of arriving at a number of cubic feet of gas, a customer would be billed for the number of pounds of hydrocarbon gas delivered. Should it be desirable, and there certainly appears to be points in its favor, the customer might be billed for the number of therms delivered, thereby eliminating the factor of buying a commodity that has no value, such as non-combustible gas at the burner tip. The application of the heat content to the number of pounds of gas delivered presents no problem and could be accomplished through linkages either electronic or mechanical at the measuring point. The resultant standardization from the use of pound and therm units would permit a solid front to be presented to the consuming public eliminating any accusation of the industry attempting to confuse the people.

The adoption of mass measurement would appear to be consistent with the current trend toward more automated facilities. Development of a density unit to be used in conjunction with the differential pressure would eliminate the need for factors of temperature, gravity and supercompressibility permitting the transmission of a maximum of two variables, the differential and density or most likely a single variable, the gas rate in pounds of gas passed. This restriction of necessity for a multiple requirement of data would free communications systems that will tend to become more and more overcrowded with the inincreased trend toward automation.

But what are today's problems with mass measurement? As mentioned previously, most mass metering units require electrical power. Since many of the existing gas meters are located in remote spots where power may not be available and since reliance upon power availability would be undesirable for continuous measurement, it would appear that an auxiliary source of power must be provided. The current day developments of the fuel cell may possibly provide the solution to this problem.

The principal problem in the use of mass meters however, may be the testing procedure for verifying the accuracy of the equipment. Manufacturers of measuring equipment are currently working on this problem. Another problem posed is the reliability of the hardware. Since the mass meter will utilize moving parts, the possibility of wear and inaccuracies resulting from usage will pose questions from industry as to the reliability of the units at all times.

In conclusion, let me say that the orifice meters in use today for the measurement of the variables necessary to calculate gas flow will continue to be used. These devices which have been used universally in industry for the past half century, have provided answers that satisfied industry and have won the unopposed acclaim of leaders in the measurement field.

Statements that I have made here are submitted as food for thought for people in the measurement operations in the hope that as the adoption of automation extends into the transmission of accurate flow data, the measurement leaders will be prepared and have answers as to the most proper approach. ■

COMMUNICATIONS—

Continued from p. 115

signaling grade (about 30 bits a second), telegraph grade (about 75-100 bits a second), or voice grade facility for tele-control or data handling use, depends entirely on the desired speed of operation.

Speed requires "band width" in direct proportion to the increase on speed.

The higher speed supervisory control and data handling equipment, usually using "solid state" or transistor components for electronic scanning or switching, will require the higher priced (if leased) voice grade circuit. You must decide whether or not the speed is worth the price.

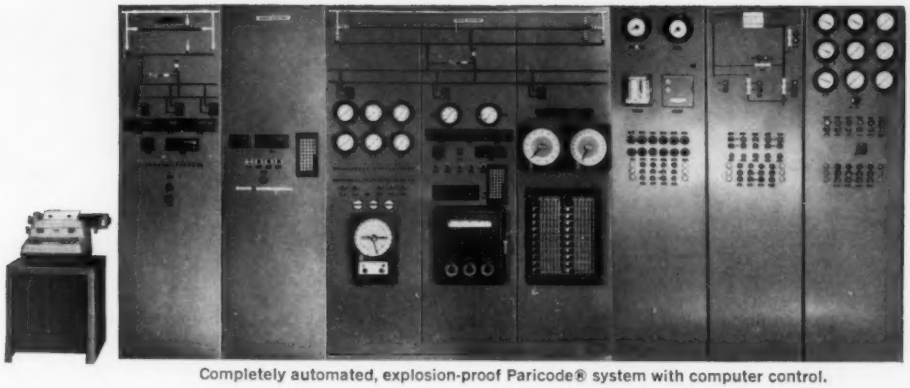
While we are on the subject of circuits, we should bring out two things to look out for if supervisory control is used, especially if all stations are tied together on a half duplex line.

1. Line delay: This can be a serious problem in extending long distance systems, where different locations lock out other locations when they need to take over the line and send out something. There is always a definite delay time for a control signal to travel the length of the line, and sometimes certain sites provide more delay than others, so that sometimes two signals arrive at a point simultaneously when actually they left their home bases at different times. This can completely confuse the receiving equipment.

This takes a lot of thought from the equipment manufacturers, and sometimes some extensive work with the communication system engineers before satisfactory operation will be obtained.

It's sometimes a little hard to realize that although communication pulses travel at 186,000 mph through free space, they are frequently slowed up when passing through various kinds of repeaters, especially on land lines. With the common carriers, many repeating amplifiers and relays could be used, and even a simple thing such as changing the route between two locations can greatly affect the delay time and really gum-up the works of a delicately adjusted supervisory control system.

2. The other bugaboo is distortion; the pulses can be torn up by circuit characteristics so that they no longer are desirable "square wave" on-and-off conditions of the receiver signal, but rather a messy combination of both. Fortunately, wave shaping repeaters which can be provided on privately owned or common carrier systems can usually cure this. ■



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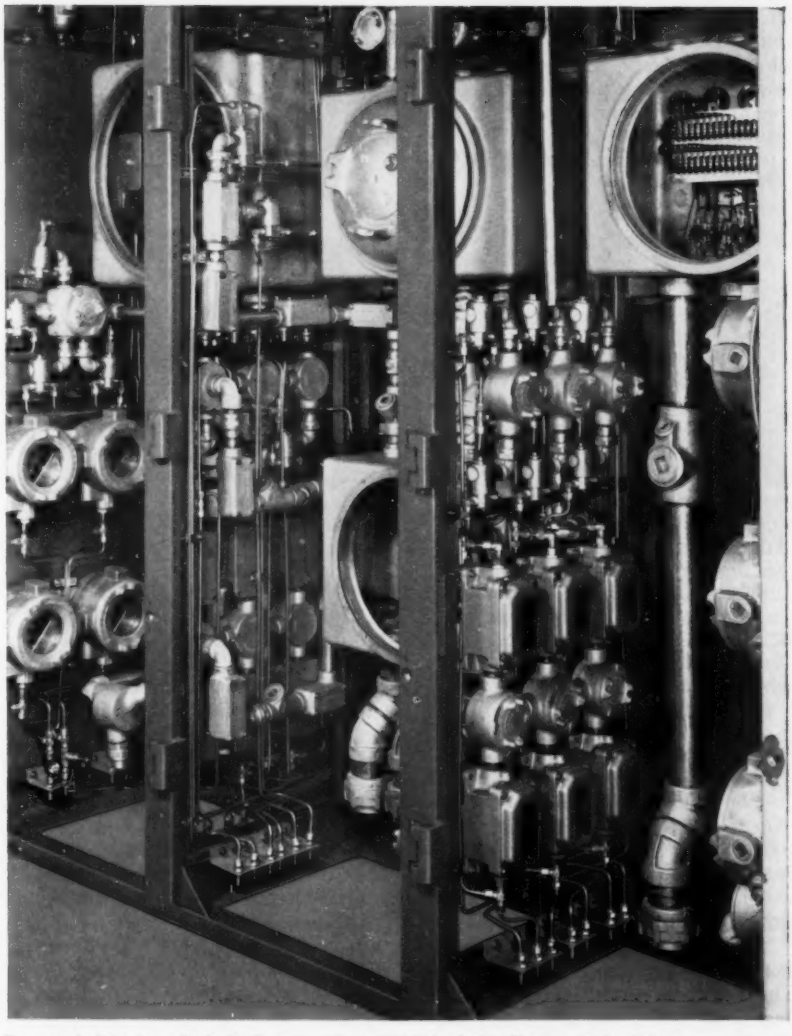
We have a copy of the detailed description of pipeline automation practice reserved for you— for your copy of "Automation for The Oil and Gas Industry" write___



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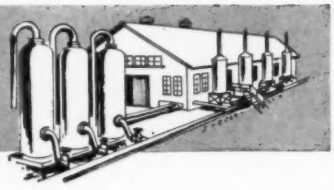
GAS PIPELINE NEWS



Kid Enchilada takes it on the chin in round 5

By ROBERT CLAY

BULLETIN! K.O. could come June 28—In an unexpected move, California PUC has ordered CalGas and SoCalEd to show cause why their Enchilada Inch application should not be dismissed or a mistrial granted because of the controversial press kit. At June 28 hearing, the two companies must also show cause why they should not be required to physically retrieve all copies of the kit and refrain from distributing such material in the future.

* * *

CHAMP GASCO landed a real haymaker, a light hook and several seemingly effective verbal jabs on the chin of the challenger, Kid Enchlada, during round five of the marathon brawl officially known as the California Public Utilities Commission hearing on Application No. 42931.

Should GAS readers need any memory jogging, the project involved in this application is variously known as: "the Enchilada Inch" to the gas industry as a whole; "that blankety-blank Enchilada Inch" to the opponents of the project (Pacific Lighting Gas Supply Co., Southern Counties Gas Co., Southern California Gas Co., El Paso Natural Gas Co., and Transwestern Pipeline Co.) and "the Mexican-American Pipeline, a $225-million cooperative project" to its proponents (Southern California Edison Co., Tennessee Gas Transmission Co., California Gas Transmission Co., Tennessee California Gas Transmission Co., Petroleos Mexicanos, Propulsora Internacional S.A. de C.V., Supervision y Servicio S.A. de C.V., and Humble Oil & Refining Co.).

Round 5 was the longest yet—five days, from June 5 to June 9. The four previous hearings were Jan. 25, 26, 27; March 15, 16, 17; May 10, 11, 12; and May 17, 18, 19. Just to put the matter in its proper perspective right now, this battle has the looks of a 15-rounder. And, in the event the challenger wins, a rematch before the FPC is considered a virtual certainty by many observers.

The ring, the state building in Los Angeles, and the referee, PUC Examiner W. W. Dunlop, were the same as for most of the previous rounds.

The lawyers, as near as we could figure out, were fairly evenly divided—about eight to ten on each side, depending on who was out "making a phone call." The audience was not as large as might be expected, considering the history-making, precedent-setting, widespread (but admittedly still far-off) consequences of the eventual outcome. This audience sat huddled and shivering, for the most part. The shivering was not in anticipation of the eventual consequences, but was due to the over - zealous air conditioning (gas) during the unseasonably chilly early June weather.

Now that we have the participants and their arena fairly well in mind, let's consider the action: the haymaker, the hook, the jabs.

The haymaker has to come first, since it could prove to be a very damaging blow, perhaps even setting up the challenger for the k.o. In mid-week, the California Commission (PUC, not boxing) gave the final go-ahead to SoCal and SoCounties for the "new" Rock Springs project. The announcement said the two companies had fulfilled conditions contained in a grant of certificate made last January. The two companies can now buy additional gas from El Paso Natural and can later construct a new pipeline to bring more gas into Southern California. This would appear to somewhat reduce chances for the Enchilada Inch.

At the same time, the commission issued a companion order denying the motion of Richfield Oil Corp. to set aside the conditional approval and reopen the Rock Springs proceeding to hear evidence on newly discovered gas fields in California. It also denied motions of both the commission staff and California Gas Transmission to consolidate to Rock Springs Enchilada Inch hearings.

The "new" Rock Springs project involves reduced gas prices and a reduced construction pace, as compared to the "old" Rock Springs project. The original contract would have resulted in costs for facilities and gas exceeding revenues by $32.1 million for the first five years. Under the new contract, this loss will be replaced by a $10-million profit. This translates into an earlier break-even date and elimination of a need for an early rate increase.

The reduced prices, from 40 cents/Mcf to 33.4 cents/Mcf during '62 and '63, are in a new contract Cal-Counties negotiated with El Paso. In addition, price was tied in with the heating value of the gas. Further, the commission reduced the amount of gas the two companies can buy under the new contract during the first three years.

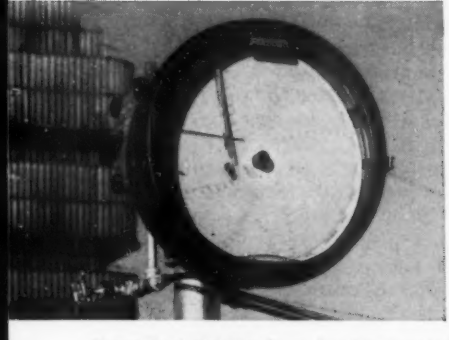
Other terms of the contract allow the expenditures of $16 million by Jan. 1, 1965 for facilities for the project. Of this amount, $893,000 may be spent by next Jan. 1 for a compressor to bring in additional gas over present pipelines, starting on that date. Gas must be carried through present pipelines for the next two years.

The left hook is a funny one. It came from way out in left field. But—even to ringsiders—it was sort of hard to figure out who hit whom. To this observer, it appeared that the champ lightly tapped the challenger squarely on the chin. The whole exchange started a week and a day before the fifth round began. A public relations firm representing the Enchilada Inch interests distributed 500 copies of what was soon to be a highly controversial press kit to "reporters, editors, and publishers of newspapers and other media in the states of California and New York."

The kit contained copies of

Remarkable performance record — Foxboro T/37 meter operates 28 months without maintenance on corrosive sour gas. Mr. K. A. Sorenson, superintendent at Shell Oil Co.'s Bryan Gas Plant, Skellytown, Texas, checks the reading.

28 months on sour gas – and not a minute's maintenance for Foxboro's T/37 "dry" meter!



Unmatched stability in a dry flow meter! No zero drift. Complete overrange protection. Foxboro T/37 meter with unique Type 316 stainless steel high-sensitivity element, provides high-accuracy, mercuryless flow measurement over wide range of differential pressures and static pressures up to 2500 psi.

A Foxboro T/37 "dry" meter has just completed a 28-month continuous service test on sour gas at Shell Oil Co.'s Bryan Gas Plant, Skellytown, Texas.

During the test period, the meter required absolutely no maintenance. A complete inspection at the end of the test showed the meter was still as good as new. Not a sign of corrosion, wear, or pitting. And absolutely no zero shift under ambient temperature and pressure tests.

Moreover, a calibration check proved the T/37 to be well within the guaranteed accuracy of ¼ of 1%.

As Mr. K. A. Sorenson, superintendent of the gas plant, puts it: "We find the T/37 dry meter ideal for this service. Performance is excellent, and highly accurate."

The T/37 is a meter you should know more about! Ask your local Foxboro Field Engineer for complete details. Or write for Bulletin 7-15A. The Foxboro Company, 347 Norfolk St., Foxboro, Massachusetts.

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KID ENCHILADA

several previously issued news releases, a reprint of a trade journal article citing California as "the Nation's No. 1 Gas Market," four pages of assorted advantages that would stem from the project, and a six-page fact sheet.

The fact sheet probably stirred up the biggest fuss among Cal-Counties people, for it drew some very definite conclusions as to just how much the failure of the commission to approve the project would cost the southern California consumer. It also told how much could be saved by the approval.

The Cal-Counties reaction was not immediate, but it was timely. On the first day of the round five hearings, the two companies filed a "Motion for Order to Show Cause Why Proceedings Should Not Be Dismissed or a Mistrial Granted." Basis of the complaint was the utilities' contention that the press kit violated instructions of PUC President Everett C. McKeage. Before round one began, McKeage had cautioned the participants against verbal low blows in the form of prejudicial propaganda, such as "news releases that would undertake to comment upon the evidence that might be given in this case, perhaps to undertake a running comment on the evidence as to its weight or veracity or that sort of thing."

Did the press kit fall into the "that-sort-of-thing" category? Cal and Counties obviously felt it did, saying it was "a slanted and inaccurate picture of the project . . . designed to influence and mislead public opinion." The two companies requested the commission to require that CalGas "Physically retrieve all copies" of the kit.

An accompanying letter signed by SoCal Vice President and General Counsel Harry P. Letton, Jr., charged that "proponents of the proposed project are preparing to take still another step in furtherance of their effort to influence public opinion. We understand that a tour is being arranged for members of the press which would include, among other things, a trip to Mexico City and other points in Mexico and Texas. Obviously, any such trip can have but one purpose —namely to promote public sentiment in favor of the project through the medium of the newspapers."

Three days later, CalGas filed its answer—a request that the Cal-Counties motion be dismissed or denied. The request used such terminology as: "an attempt to encircle these proceedings with an iron curtain," "shocking and unwarranted attempt to impugn the motives of CalGas and to impute to the presiding commissioner an intent to infringe upon the freedom of the press."

Furthermore, charged the request, McKeage's instructions were prompted by the "misleading and inaccurate information about the proposal of CalGas" distributed by the two utilities to the public in U. S. and Mexico before the hearings got underway. It contended that "this barrage of distorted and biased information constituted the rankest form of propaganda." While admitting that this barrage had stopped, the request added that a recent PLGS annual report had contained additional "erroneous allegations."

On the other hand, said the CalGas reply, the press kit was only meant for the press in two states, and was only in response to "a great many inquiries . . . . . by representatives of the press." Finally, the request absolutely denied that a press trip to Mexico had been planned.

The day after the request was filed, the Los Angeles Herald and Express quoted PUC Chief Counsel William M. Bennett as saying that the issue "had been carried to proportions beyond its importance" and that the hearings would continue without interruption.

And that, faithful fight fans, brings us to the several seemingly effective verbal jabs. As already related, the entire week was spent in cross examination of the proponent witnesses. To say the least, such cross examination is considerably less exciting than that in, say, a wife-beating case . . . . or even petty larceny. Utility and industrial lawyers seem to underplay their case during cross examination, They prod the witness for chinks in his armor, but stop as soon as they find the indent. Their intent: merely to locate the weak spots for future exposure—when they present their own case.

Not so with one Malcolm Dungan, a San Francisco attorney hired for the case by El Paso Natural. Looking somewhat like a short-screen Perry Mason, Dungan prodded his witnesses with the dogged determination of the famed TV attorney. And when he found a chink, he twisted in his spear and pried off a piece of armor, exposing the witness' bare flank for all to see. His prodding was peripatetic, performed on the periphery of the attorney's platform. Hanging on to his lapels with both hands, he'd make tight teetering little spins behind and alongside his chair, all the while hammering relentlessly at his witness.

Witnesses cross-examined during the fifth round were Fred A. Hough, chief gas engineer for the Bechtel Corp.; Harley F. Eaker, vice president of CalGas; W. C. Gilman, head of a private consulting firm bearing his own name; and Sherman Clark, a senior industrial economist of the Stanford Research Institute.

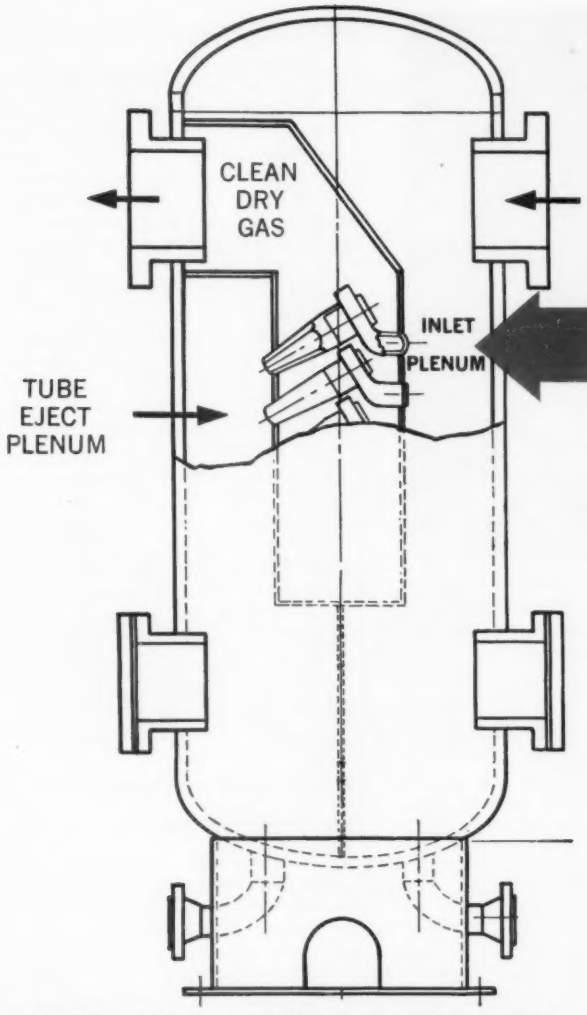
Clark testified on May 10 that southern California electric consumers could save $174 million during the next 20 years if the Enchilada Inch is approved. A man with a title like his from a place like SRI is not the sort most people would try to tie in verbal knots. But, during round five, Dungan not only tried, but succeeded on several occasions. Frequently, there were long pauses between his questions and Clark's answers. At one point, Clark admitted that Dungan had him "in a box." At another point, the following dialog took place:

> Clark (embarassed, it seemed): "That's a good point."
> Dungan stood silent in almost contemptuous triumph.
> Clark, (more embarassed, with a half-grin): "Was that a good answer?"
> Dungan (with icy politeness): "No, sir!"

This same pair will again square off when round six begins in the same ring at 10 a.m., July 10. Others scheduled to be cross examined during that week (the hearings will be held five days, through the 14th) include: Joseph L. Parrish, Robert W. Harrison, Serapion Fernandez, and Alfonso Barnetsche. Those who are not cross-examined in July will take the stand in September, since there will be no hearings in August.

Tentative September dates are 20, 21, 22, and 27, 28, 29. Definitely expected to testify in September is former FPC Commissioner William R. Connole

Thus, the current titleholder won't get to the stand to present the opposition side until sometime in September, after seven or eight rounds go by. Barring an unlikely "press kit K.O.," it looks like a 15-rounder and it's still anybody's fight.



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In ordinary cleaners debris, slugs of dust, liquid and muck can plug or damage tube inlets or internals to rapidly decrease efficiency, increase pressure drop.

This cannot happen with a Blaw-Knox type D-LS Combination Dry Gas Scrubber and Liquid Separator. The miniature cyclone tubes are solidly welded into a tube sheet enclosure permitting clean and dry gas to be discharged into this separate compartment. As illustrated, this construction forms an inlet plenum on one side and a tube eject plenum on the opposite side.

An inlet plenum on this type of scrubber provides:

1. A primary separator where, by expansion, much of the dust, and/or liquid and debris drops into the reservoir before it can plug or damage the cyclone tubes.
2. Equal distribution of gas flow through the tubes.
3. Unobstructed gas inlet to the cyclone tubes.
4. Insurance of constant pressure drop.
5. Preservation of high efficiency.

There are other reasons why the Blaw-Knox D-LS Scrubber gives you clean, dry gas: abrasion-resistant, alloy cast iron cyclone tube design — sturdy, welded construction — high efficiency with low pressure drop, are a few. Write for Catalog 394 for all the facts—or ask our representative to call. Buflovak Equipment Division, 1547 Fillmore Ave., Buffalo 11, N.Y.

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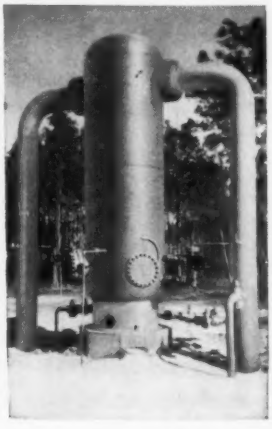

This Blaw-Knox D-LS Combination Dry Gas Scrubber and Liquid Separator is installed at a town border station. Other applications are: **Compressor Stations,** on the suction side to remove solids and liquids and on the discharge side to remove carbon and condensed lube oil; **After Coolers or Condensers,** on the discharge side to remove entrained liquids and oil or water mist; **Compressor Stations, City Gate Stations and Large Industrials,** upstream from existing oil bath gas cleaner installations to remove condensate and prevent dilution of the scrubbing oil, and downstream to remove and recover entrained oil; **Dehydration Plants** as a combination unit to remove solids and liquids upstream, and downstream of the adsorption type plant to remove dust caused by attrition of the solid dessicant, and downstream of the absorption type to remove the entrained liquid dessicant.

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Gas sold by Gulf Oil Corp. to American Louisiana is heading north to heat homes and businesses in the western Great Lakes region. The 24-in. spur line being completed in the foreground was tested recently after being tied in 24 miles away to American Louisiana's mainline.

Swampy crossing complicates new line

Gulf Oil Corp. is selling 50 MMcfd from the Krotz Springs, La. cycling plant to American Louisiana Pipe Line Co., Detroit.

American Louisiana completed a 24-mile spur line linking its northbound mainline with the Gulf-operated plant, 35 miles west of Baton Rouge.

The 50 MMcfd purchase amounts to approximately 15 per cent of the average daily volume purchased by American Louisiana in the area.

Construction of the final link of the 24-mile line was complicated by the need to cross 4 miles of swampy West Atchafalaya floodway. Using backhoes working on timber mats, crews gouged out a broad trench more than 20,000 ft long which immediately filled with water. Crews fabricated the line on an "island" prepared as a construction pad and launching ramp. Securing steel drums to the cement-coated line, they floated it in the trench. As each joint of pipe was welded on, cat tractors pushing from the ramp and spud-barges pulling and guiding the plugged nose of the line snaked it through the water across the swamp. The push-and-pull efforts were coordinated by walkie-talkie radio.

One section was pushed 4000 ft eastward to connect with pipe on dry land near the Gulf plant. The other section was tugged and shoved more than 16,000 ft westward to connect with pipe already laid to the floodway levee. After the line was strung, the floats were cut free, permitting the line to settle to the trench bed, which will be backfilled later. Ford, Bacon & Davis Construction Corp., prime contractor on the job, laid the dry land portions of the line. The swamp crossing was made by Glaser Construction Co. of Lafayette, La.

Gulf added manifold equipment at the plant site to complete the tie-in. The Krotz Springs field unit, comprised of 39 producing wells, covers more than 6000 acres.

New supply okayed

FPC told Trunkline Gas Co. it can build about 77 miles of 26-in. pipeline and 24 miles of 18-in. loops in Louisiana. Also approved in the $18 million construction program was 24,000 additional hp in eight existing compressor stations.

The facilities will be used to deliver an additional 54.1 MMcfd to 12 existing customers, principally Mississippi River Transmission Corp. and Illinois Power Co. Each will receive an additional 25 MMcfd.

Transco's supply okay; construction approved

FPC authorized construction of nearly 30 miles of pipeline by Transcontinental Gas Pipe Line Corp. The new facilities, estimated to cost $54.5 million, will enable Transco to increase supplies to existing customers by 114.7 MMcfd.

Last August, FPC questioned Transco's future gas supply, declaring that it was inadequate to justify the expansion. The agency's staff now reports that Transco has gas reserves reasonably to meet its need for 12 to 14 years.

FPC also permitted five producers to sell gas to Transco from Texas fields. Final action on 17 applications for supply from southern Louisiana fields was deferred.

Transco will build some 286 miles of 36- and 30-in. mainline loops in Texas, Louisiana, Mississippi, Alabama, Georgia, and South Carolina and 38,540 additional compressor horsepower. Also included are sales laterals, river crossings, small diameter purchase laterals, meter, measuring and regulator stations.

United and producers gas sale okayed

New facilities authorized for United Gas Pipe Line are designed to transport about 330 MMcfd from the Bastian Bay and West Bastian Bay fields, Plaquemines Parish, La.

The $16.9 million project consists of some 59 miles of 36-in. line.

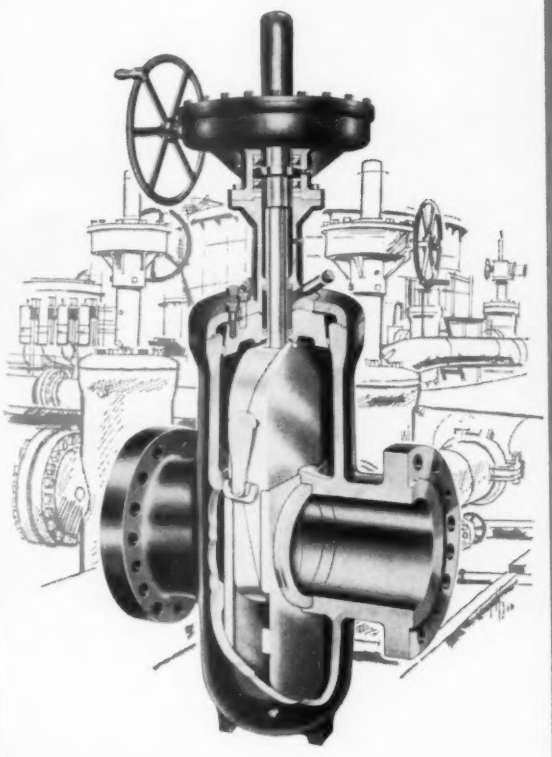
Producers—Gulf Oil Corp. and Tidewater Oil Co.—proposed initial prices of 24.8 cents per thousand including tax reimbursement. The commission conditioned the producer's temporary authorizations to 23.25 cents per Mcf (inclusive of tax reimbursement) and required the refund to United of any amounts later found by FPC to be excessive. If the proper rate is found to be less than 20 cents per Mcf, the producers will have to refund any amounts collected at the rate above the 20 cents.

Texas Gas diversifies

Texas Gas Transmission Corp., Owensboro, Ky., has acquired a controlling interest in Kentucky Electronics Inc., a small manufacturer of electronic components, also located in Owensboro.

Texas Gas President W. M. Elmer said the acquisition provides his company with a "modest interest in a diversified industry which the company feels has good potential."

TWO SUPERIOR GATE VALVES FOR EVERY PIPELINE NEED



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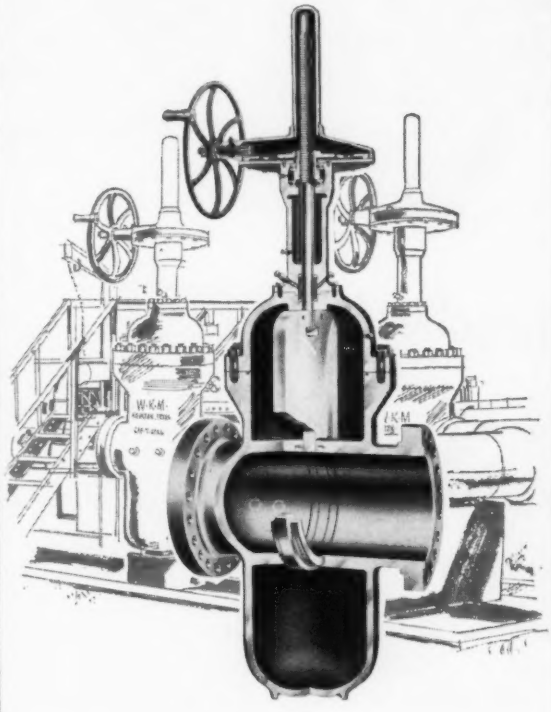
No valve made equals the W-K-M Leverlock Gate Valve where a rigid mechanical seal is demanded. Double-wedge parallel-expanding gates controlled by a mechanical centralizing device, plus steel seats with Teflon* inserts, give the most positive seal obtainable — upstream and down — under all operating conditions. Severe pressure fluctuations, from any cause, have no effect on the dead-tight seal. The W-K-M Leverlock is non-lubricated, rarely requires maintenance. On-the-line maintenance is performed in less time than removing the valve from the line. W-K-M Leverlock Gate Valves tie together most of the world's newest pipelines. Available in sizes 2" - 36", working pressures ASA 300 - ASA 2500. Send for Catalog 300, P. O. Box 2117, Houston 1, Texas.

*Du Pont's tetraflourethylene resin

W-K-M Saf-T-Seal Through-Conduit Gate Valves

The W-K-M non-lubricated Saf-T-Seal excels in economy and efficiency wherever a pressure sealing type of gate valve is desired. It uses dynamic pressure-actuated seats with Teflon inserts. Line pressure powers the seats and gate to give a perfect up and downstream seal. The initial seal is Teflon-to-metal. Contact between the gate and the downstream seat makes a complete metal-to-metal seal. The W-K-M Saf-T-Seal Gate Valve automatically relieves excess body pressure. This valve is as maintenance-free, and easy to repair when necessary, as its companion valve, the W-K-M Leverlock. Available in sizes from 2" - 36", working pressures from ASA 150 - ASA 900. Send for Catalog WS 1061, P. O. Box 2117, Houston 1, Texas.



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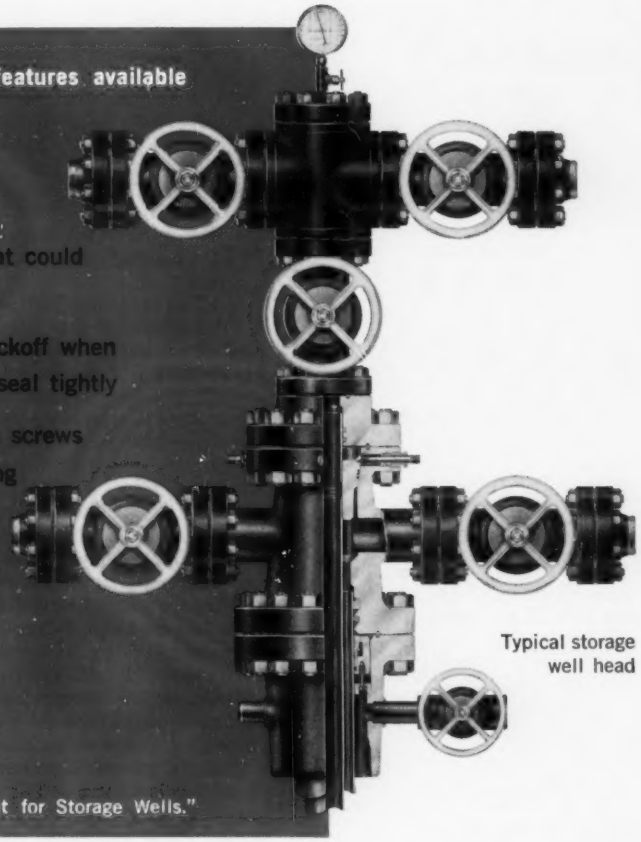

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FPC studying pipeline quality standards

FPC has proposed that natural gas sales contracts between producers and pipelines will not be acceptable if they contain certain provisions in daily-contract quantity and take-or-pay-for clauses. The commission also is considering a rule or policy statement amendment to prescribe the minimum quality, pressure and delivery provisions to be used as standards for determining whether natural gas is of "pipeline quality."

In the first rule-making notice (R-199), FPC said it is convinced that clauses in contracts between producers and purchasers containing certain provisions are not in the public interest. The questionable clauses are those which provide for a daily-contract-quantity in excess of 1 Mcf for each 8 MMcf of dedicated original reserves, and a take-or-pay-for provision which exceeds 80 per cent of this daily-contract-quantity on an annual basis. FPC recognizes the desirability of long-period contracts when gas is purchased for interstate transmission. But, it said, contracts containing provisions contrary to the public interest should not be accepted for filing as rate schedules or should not be given formal recognition in support of certificate filings.

In its second notice (R-200), FPC said the proposed standards for "pipeline quality" gas would relate to all certificate and rate proceedings. The standards would prescribe minimum criteria for quality, pressure, and delivery conditions for determining whether gas, as delivered, is of "pipeline quality" as set forth in FPC's general Policy statement 61-1.

FPC will make certain price adjustments in independent producer rates whenever the gas, as delivered, deviates from the proposed standards.

The criteria in the proposed standards relate to the heating value of gas; water content; liquefiable hydrocarbons; hydrogen sulfide and sulfur content; freedom from objectionable odors, dust, solid or liquid matter which may interfere with merchantability or line operations; and delivery point and pressure. Certain downward price adjustments would be established to compensate for deviations from the standards.

Canadian gas plan reaffirmed

A 13-month old decision authorizing St. Lawrence Gas Co., Ogdensburg, N. Y. to import gas from Canada has been reaffirmed by an FPC presiding examiner.

The Canadian gas will serve the Massena-Ogdensburg area of New York state. When the first decision was filed in April 1960, St. Lawrence' Canadian supplier had not been authorized by the Canadian National Energy Board to export gas. However, the authorization was issued later.

Sales and resale plan approved

An FPC presiding examiner has granted permanent certificates for the sale of gas by a producer to a small pipeline company which, in turn, resells the gas to El Paso Natural Gas Co.

Under the plan, Oil Inc. will sell gas from the Westover field in Utah to Grand Valley Transmission Co., an affiliate. Grand Valley will build a 16-mile line to transport the gas for resale to El Paso.

Oil Inc. sells the gas to Grand Valley at a proposed initial price of 12 cents per Mcf. Grand Valley's sale price is 17.5 cents to El Paso. Examiner Binder said the principal issue was the 5.5-cent price spread.

The spread was questioned both by FPC staff and by Southern Counties and Southern California Gas companies, El Paso customers. FPC staff, supported by the Los Angeles companies, urged the examiner to condition Grand Valley's certificate to require the company to file detailed data after the first two years of operation and after any succeeding year, if any, in which the average daily deliveries exceed 9 MMcfd. The proposed conditions also would require Grand Valley to file revised rate schedules, if necessary, reflecting cost of service data.

The examiner held, however, that the proposed conditions should not be imposed. He pointed out that under FPC regulation, Grand Valley will be required to file annual reports containing substantially the information which would reflect the facts required by the proposed condition.

On the proposal to require Grand Valley to file revised rate schedules, Examiner Binder said it would be "rather unsophisticated" to believe that a small pipeline company would consider it "necessary" to file rate schedules to lower its rate of return. Furthermore, he noted, without the company's consent the only way FPC could require the filing of lower rates would be to institute proceedings under the Natural Gas Act. The commission could and would do this in an appropriate case with or without the proposed condition, he said. Therefore, he continued there is no good reason for the imposition of this condition.

Tulsa company acquires gas dehydration rights

Dehydrators Inc., Tulsa, has acquired restricted rights on issued patents and exclusive rights to patents pending to Laurence S. Reid pertaining to dehydration of gases by glycol absorption.

Reid, a professor of chemical engineering at the University of Oklahoma, has "firsts" in gas dehydration including well-head glycol absorption processes, the glycol injection process, triethylene glycol as a natural gas dehydrating agent, and the standard correlation between dew point and the water vapor content of natural gases.

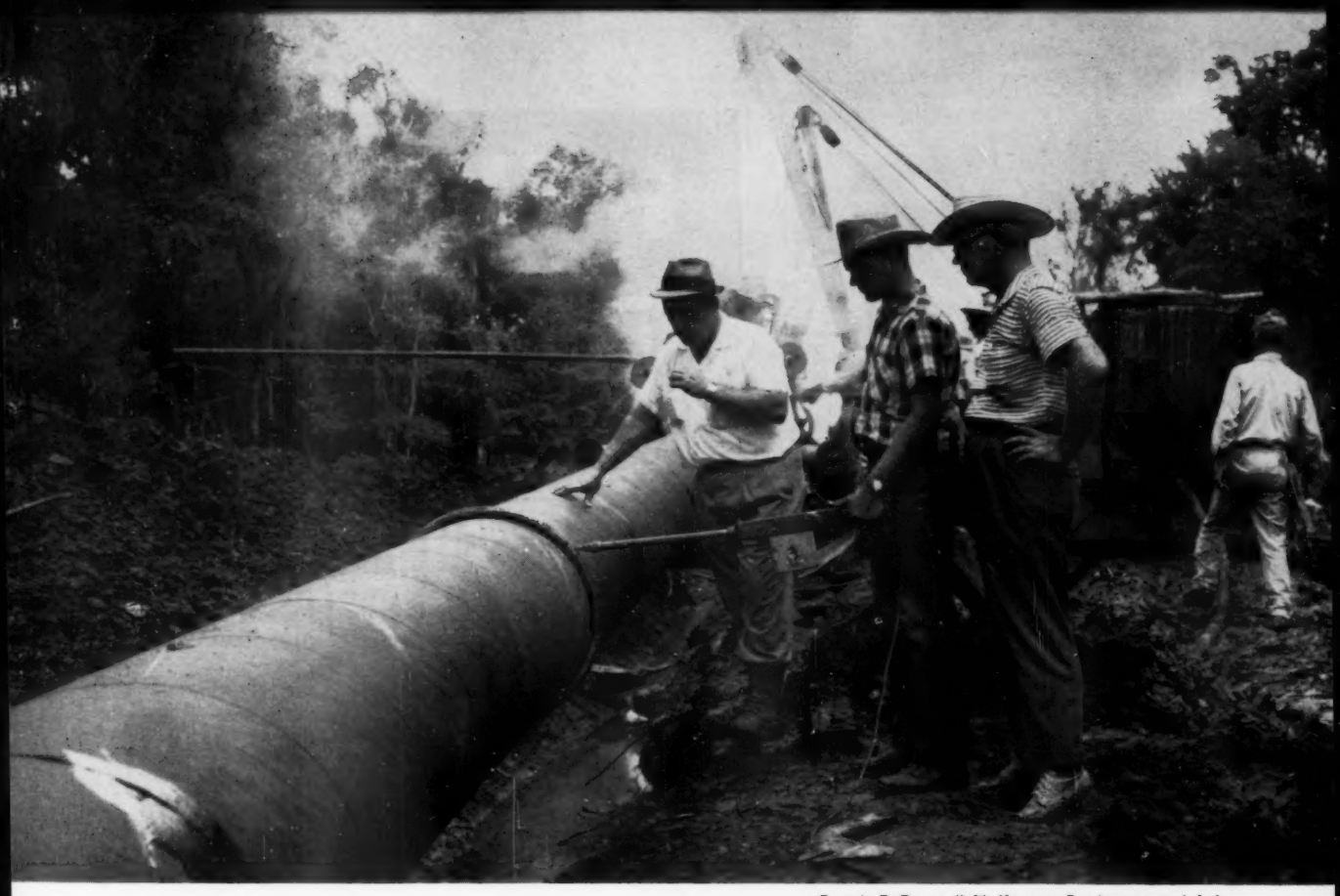
Dehydrators has retained Reid as principal design consultant responsible for a line of glycol dehydrators to be made available to the gas industry.

GAS • Pipeline Notes

A purchase contract has been signed by Pacific Lighting Gas Supply Co. for gas to be produced by Phillips Petroleum from interest in wells offshore of Santa Barbara, Calif. Deliveries will begin on or before Sept. 1.

Midwest Piping, a division of Crane Co., held its 1961 sales meeting recently in St. Louis. Crane Co. purchased Midwest in April and held the meeting to redefine the relationship and sales objectives of the parent company and its new division.

Foxboro (Mass.) Co. has completed a new instrument manufacturing and assembly building at the Foxboro (Nederland) N. V. plant in Soest, Holland.



Francis DeRouen (left), Koppers Serviceman, and A. L. Eubanks, Inspector for Ford, Bacon & Davis, Monroe, Louisiana, watch "jeep" test on finished coating job.

Bitumastic® Enamels and Koppers service helped us lick our tough protection problems

"A thorough background of experience is extremely important on pipeline jobs, and Koppers Serviceman DeRouen has plenty of it," says Mr. A. L. Eubanks, Spread Inspector for Ford, Bacon & Davis, the engineering firm that designed and supervised the installation of Old Ocean Fuel Company's 24-inch gas line to Ft. Worth and Graham.

"Francis DeRouen's 26 years of experience with protective coatings helped us solve some knotty application problems on this job," Mr. Eubanks continued. "He helped us get the maximum corrosion protection with Bitumastic enamels on the really tough parts of the line, where heavy, wet gumbo places severe stresses on the pipe. We appreciated his services and our coating foreman profited from his advice."

The line was cleaned first with a Bitumastic Primer Solution. This was followed with a hot-applied coating of Bitumastic No. 70-B Enamel, at a temperature of 400 degrees F. Next a glass reinforced wrap was applied as an extra protective precaution. Finally a loose wrap of kraft covered with a tar-saturated No. 15 felt was placed around the pipe as a loose sleeve to protect the coated pipe from soil stress.

A Koppers Serviceman can help you solve your corrosion protection problems with Bitumastic coatings. For more information on Koppers servicemen and the Bitumastic coating line, mail the coupon or write: Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa. District Offices: Chicago, Los Angeles, Pittsburgh, New York, Woodward, Ala., and Houston, Texas (Mavor-Kelly Co.). In Canada: Koppers Products, Ltd., Toronto, Ontario.

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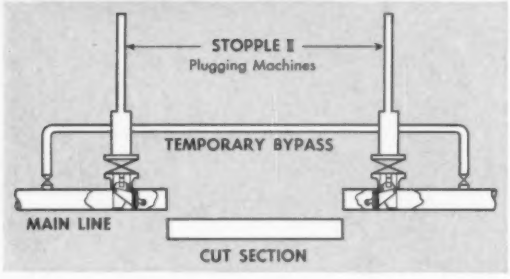
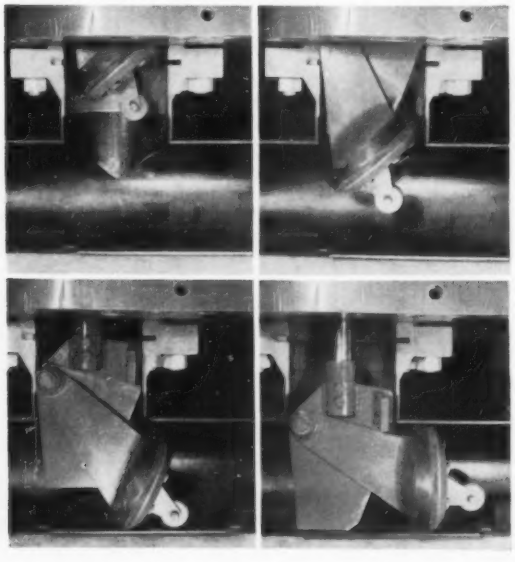


❶ "This method of plugging a line and bypassing the flow has been used extensively in plant and field operations with WMSon tapping and STOPPLE equipment. Many costly shutdowns have been avoided. Now, WMSon engineers have re-designed and improved the STOPPLE Plugging Machine. Result . . . the all new STOPPLE II . . . offering hydraulic operation, improved, simplified construction, and economy—**real** economy!"



❸ "Here's how STOPPLE II works. After the tap is made, the STOPPLE II is mounted on a WMSon SANDWICH Tapping Valve, and the plugging head is lowered into the line, stopping the flow completely. New single link construction of the plugging head offers built-in simplicity . . . and strength for high pressure plugging."

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NEW improved design
NEW interchangeable plugging heads . . .

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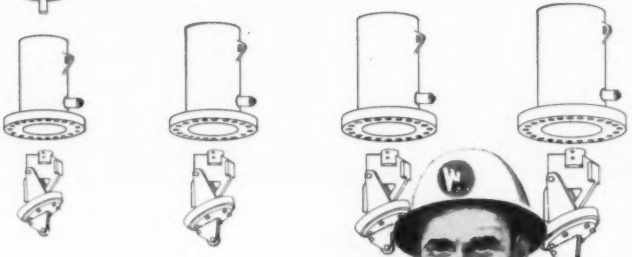

❷ "Here's the major reason for this economy. The STOPPLE II has a hydraulic cylinder that is interchangeable with plugging heads of different sizes. For example, one hydraulic cylinder can be used on a 14", 16", 18" or 20" line by using it in combination with a plugging head and housing of the proper size."

•

WMSon STOPPLE II with hydraulic operation is available in sizes 8"–30". The 4" and 6" units are hand operated. Single link is standard in all sizes. Write for additional information and specifications: Write Dept. C for Bulletin A-513.

U.S. AND FOREIGN PATENTS AND PATENTS PENDING

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REPRESENTATIVES AROUND THE WORLD

NPC reports on proved discoveries

The National Petroleum Council has released a comprehensive report on proved discoveries and productive capacity of crude oil, natural gas, and natural gas liquids in the U. S. The study was made by the council's Committee on Proved Petroleum and Natural Gas Reserves and Availability.

Here are a few highlights of the report:

The productive capacities of crude oil, natural gas liquids, and natural gas in the U. S. on Jan. 1, 1960 were estimated to be: crude oil, 10,585,000 bbl daily; natural gas liquids, 1,799,600 bbl daily; natural gas, 71,504,000 Mcfd.

These estimates represent the rates at which gas, oil, and natural gas liquids could be produced, on Jan. 1, 1960, from existing fields and wells without regarding such limitations as lack of surface facilities for handling, processing, storage, or transportation; and without reference to governmental regulations under normal peacetime conditions. They therefore represent potential rather than actual availability.

Here are the discovery estimates, through 1954, contained in the report and representing the total expected recoveries, including both past production and remaining proved reserves. They are based upon field size and past performance, as such factors were known on Dec. 31, 1959: crude oil, 91,424,672 thousand bbl; natural gas liquids, 10,408,958 thousand bbl; natural gas, 419,052,526 millions of cu ft.

The committee interprets its findings as showing:

1. The estimated proved recovery from newly discovered fields when estimated at the end of the original discovery year by present industry concepts and methods, represents only a small fraction of the hydrocarbons that will ultimately prove to be recoverable.

2. The aggregate of all fields discovered, from newly discovered ones to those a century old, represents an enormous base for future additions to reserves through further extensions and revisions.

3. The rate of discovery of new fields, and the rate of increase in estimated additions to reserves of existing fields, are inextricably related to the intensity of the effort expended in the search for oil, in both exploratory and development drilling, and in technologic development and its application through improved recovery methods. The intensity of such activities depends, in turn, on the needs reflected in growth in demand, and on economic incentives.

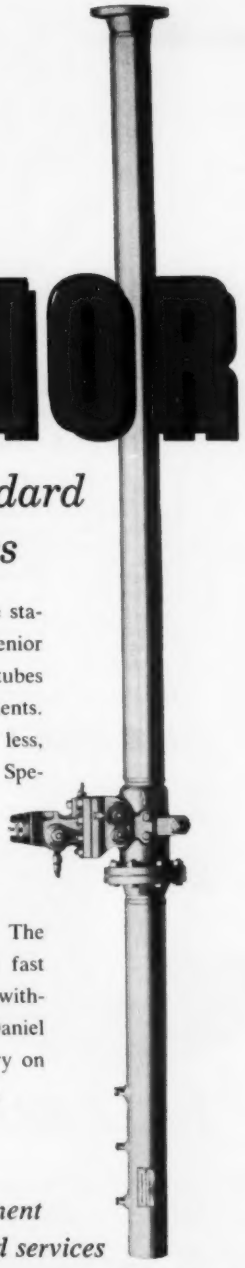
Complete copies of the report are available from the National Petroleum Council, 1625 K St. N. W., Washington 6, D. C.

United plan approved

United Gas Pipe Line Co., Shreveport, has temporary authority to construct about 217 miles of 30-in. line from St. Mary parish to Ouachita parish, La. Cost of construction: $31.8 million.

The new line, to meet increased demands of existing customers in north Louisiana and northeastern Texas during the 1961-62 winter season, will have an initial capacity of 358 MMcfd.

FPC said the temporary okay does not include authority to deliver and sell additional volumes to Texas Gas Transmission Corp., as requested in United's application.



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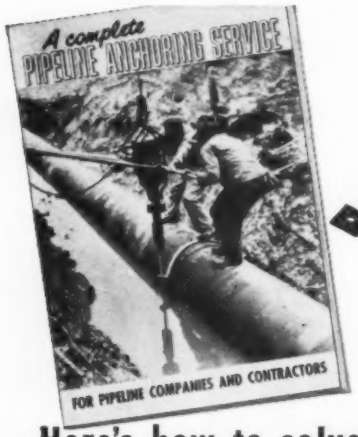

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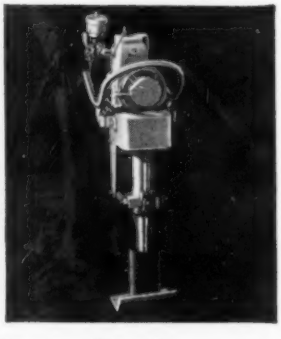

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Newly authorized facilities will enable Cities Service Gas Co., Oklahoma, to increase the adequacy and efficiency of parts of its system in Kansas and Missouri. The company will loop and replace portions of its Ottawa-Sedailia-Carrollton line, the Springfield line; its Neosho line; and the Range line.

American Standards Association has published the 1961 Catalog of American Standards. The free booklet contains a listing of special publications in the standardization field, pamphlets and standards recommendations of the International Organization for Standardization and the International Electrotechnical Commission. ASA's address is 10 E. 40th St., New York 16.

Cooper-Bessemer Corp., Mt. Vernon, Ohio, has purchased Kline Manufacturing Co., Galena, Ohio. Kline manufactures hydraulic pumps and motors. It will operate as a wholly owned subsidiary of Cooper-Bessemer.

TRW Computers Co., division of Thompson Ramo Wooldridge Inc., and the Swartwout Division of Crane Co., have agreed to provide complete automatic control systems to the chemical, petrochemical and petroleum industries. The agreement makes the complementary equipment and technical resources of each company available to the other. Both companies will be able to meet more comprehensive and complex systems requirements.

Chandler Engineering Co. has moved into larger quarters in Tulsa. The new building, designed for future expansion, has 10,800 sq ft inside, more than twice as much space as the former quarters. The property includes 5 acres of land.

Foxboro (Mass.) Co. plans to acquire assets of Waugh Engineering Co., Van Nuys, Calif. Waugh manufactures electro-mechanical and electronic instruments. It will operate as a division of Foxboro.

An agreement of mutual support in the engineering and marketing of automated controls systems and processes has been announced by Allis-Chalmers, Consolidated Systems Corp., and International Business Machines Corp. A typical integrated system will use Allis-Chalmers' basic industrial equipment, Consolidated Systems' special instrumentation, and IBM's data processing equipment.

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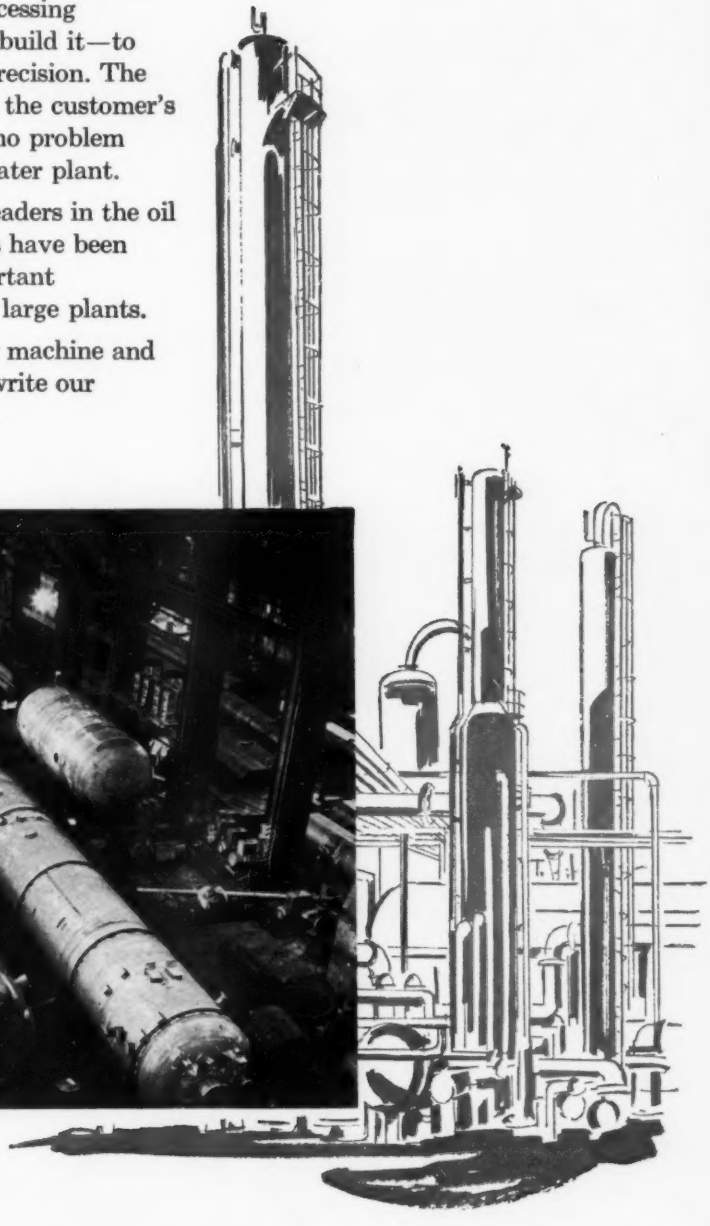

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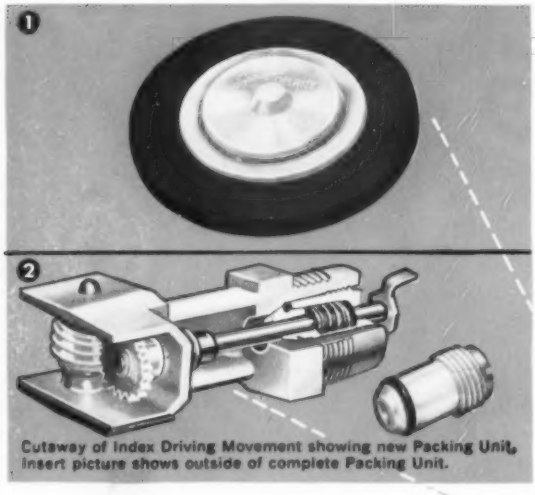

Cutaway of Index Driving Movement showing new Packing Unit, insert picture shows outside of complete Packing Unit.

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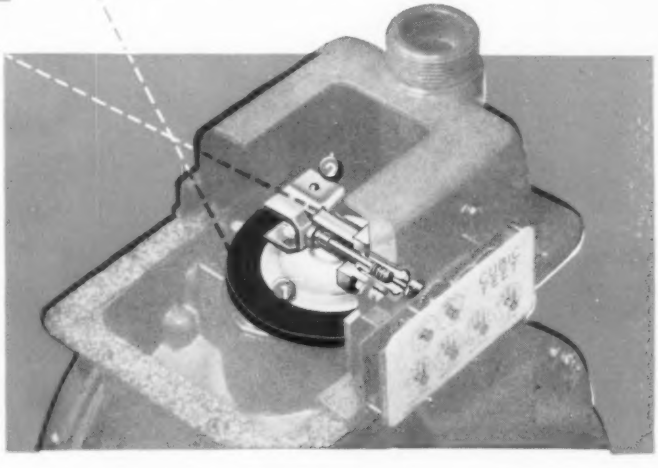

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